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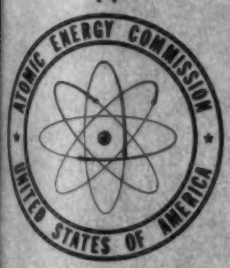

Technical Information Service Extension, Oak Ridge, Tenn.

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The U. S. Atomic Energy Commission has reviewed its classified reports on an accelerated basis to release the maximum amount of information possible to the national nuclear energy program. Older reports declassified in this review program are being announced in supplements to regularly scheduled issues of *Nuclear Science Abstracts*. Current unclassified AEC reports are announced routinely in the semimonthly issues of *Nuclear Science Abstracts*.

Abstracts in these supplementary issues are numbered consecutively with those in the regular issues of *Nuclear Science Abstracts* to facilitate uniform bibliographic control. The abstracts are indexed by author in each issue. Subject indexing will appear in the semiannual and annual issues of the current volume of *Nuclear Science Abstracts*. Each issue also includes a Numerical Index of Reports for the reports abstracted in the issue. This index provides availability information for each report abstracted. The semiannual and annual issues of this volume will provide complete coverage for all reports abstracted in the supplementary issues.

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NUCLEAR SCIENCE ABSTRACTS

A Publication of the United States Atomic Energy Commission Technical Information Service Extension.

The printing of this publication has been approved by The Director of the Bureau of the Budget, June 15, 1956.

INTRODUCTION

Nuclear Science Abstracts (NSA) is issued twice a month by the Atomic Energy Commission (AEC). It is intended primarily to serve scientists and engineers working within the Atomic Energy Project, by abstracting as completely and as promptly as possible the literature of nuclear science and engineering. It covers not only unclassified and declassified research reports of the AEC and its contractors, but also material in its field of interest which appears in unpublished research reports of government agencies, universities, and industrial research establishments, and in the technical and scientific journals.

DECLASSIFICATION

The issuance of these abstracts does not constitute authority for declassification of any reports.

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Nuclear Science Abstracts is indexed by personal and corporate author, by subject, and by report number. Annual index issues are prepared for each volume. A cumulated index to Vols. 1–4 was issued as Vol. 4, No. 24B, Dec. 30, 1950, covering authors, subjects, nuclides, and report numbers. The 24th number of Vols. 5, 6, and 7 contains indexes covering the individual volumes, as well as a cumulated Numerical Index of Reports covering *Abstracts of Declassified Documents (ADD)*, Vols. 1 and 2, and the previously issued *NSA* volumes. Issue 24A of Vol. 8 contains Author and Subject Indexes and a Numerical Index of Reports for items abstracted in that volume. This issue contains Personal Author, Corporate Author, and Subject Indexes and a Numerical Index of Reports for items Abstracted in Vol. 9. A separate publication (TID-4000, *Cumulated List of Available Unclassified AEC Reports*) contains a Numerical Index of Reports cumulated through Vol. 8 of *NSA*.

Each issue of Vol. 10 (1956) contains an Author Index and a Numerical Index of Reports for abstracts in that issue as well as new availability information on reports abstracted previously. Subject and Author indexes, as well as a cumulation of the Numerical Index of Reports, are issued as a supplement to the 12th issue. The 24th issue will be the annual index for the volume.

Nuclear Science Abstracts carries in issues 6B, 12B, 18B, and 24B lists of New Nuclear Data in which experimental results are displayed in tabular form and arranged by element and isotope, with each entry including a reference. The listing in No. 24B is the annual cumulation. The lists of New Nuclear Data are compiled by the Nuclear Data Group of the National Research Council, Washington 25, D. C. The New Nuclear Data items are also supplied by this group on 3 × 5 in. cards for $20.00 a year domestic and about $30.00 a year foreign (air mail postage included).

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Translations. The complete series (NSF-tr) of National Science Foundation translations is available at the depository libraries. Other translations from Russian are available at the Scientific Translation Center, Library of Congress, Washington 25, D. C., and translations from other foreign languages are available at the SLA Translation Pool, John Crerar Library, Chicago, Ill. The availability of translations from these centers is indicated in the Numerical Index of Reports.

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General Information on Location of Reports. If the searcher knows the report number, he should look in TID 4000, *Cumulated List of Available Unclassified AEC Reports*, or in the Numerical Index of Reports appearing in *NSA*, Vol. 9, No. 1, et seq. If the searcher does not know the report number, searching is aided by the annual or cumulated subject and author indexes. The indexes refer to an abstract from which the report number may be obtained, and the information regarding availability can then be obtained from the Numerical Index of Reports. Declassified reports numbered MDDC and AECD through 2023 are indexed by subject and author in the separate *Declassified Documents Cumulated Index*, and their abstracts appear in *ADD*, the forerunner to *NSA*. These publications, as well as the first five volumes of *NSA*, are not available for sale but may be consulted at the AEC depository libraries.

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NUCLEAR SCIENCE ABSTRACTS

Volume 10 October 31, 1956 No. 20 Suppl.

BIOLOGY AND MEDICINE

RADIATION HAZARDS AND PROTECTION

9723 HW-30142
Hanford Atomic Products Operation, Richland, Wash.
COMPARATIVE STUDY OF ALTERNATIVE FIBROUS GLASS AND SAND EXHAUST VENTILATION AIR FILTER INSTALLATIONS FOR PUREX. Lyle L. Zahn, Jr. Dec. 14, 1953. Changed from OFFICIAL USE ONLY July 6, 1956. 18p., 2 illus. Contract [W-31-109-eng-52]. $6.30 (ph OTS); $3.00(mf OTS).

Results are presented from a study of the relative merits of fibrous glass and sand filter installations for the Purex Plant ventilation air system. Data are presented on both the economics and operating characteristics of the two installations. (C.H.)

9724 NYO-4569
Rensselaer Polytechnic Inst., Troy, N. Y.
THE FATE OF FISSION PRODUCTS DEPOSITED IN THE RESERVOIRS OF THE TROY, NEW YORK AREA FOLLOWING NUCLEAR DETONATIONS DURING THE SPRING TESTS OF 1953. E. J. Kilcawley, H. M. Clark, H. L. Ehrlich, W. J. Kelleher, H. E. Schultze, and N. L. Krascella. Dec. 16, 1953. 152p. Contract AT(30-1)-1556. $24.30(ph OTS); $7.50(mf OTS).

The data presented show that rainfall in the Troy-Albany area was radioactive. As expected the radioactivity was associated with the bomb tests conducted at Yucca Flats, Nevada. The higher activities correlated with bomb explosions. The maximum activity found was 25 μμc per ml. which occurred five days after the explosion of bomb number 11. Although the last bomb of the series was fired on June 4th, the activity of the rain water collected as late as August 4 had only decreased to about 0.2 μμc per ml. including natural activity. The sample collected on June 29, at the Troy Reservoir station was examined for alpha activity and long-lived alpha activity was found to be present. It is unrealistic to express the decay by a simple equation, e.g. $A = A_0 t^{-1.2}$, because of the mixing of fission products from several bombs, and the possible variation in the nature of the fission products with the type of bomb. (auth)

CHEMISTRY

9725 CF-54-5-59
Oak Ridge National Lab., Tenn.
PHYSICAL PROPERTIES OF THORIUM OXIDE SLURRIES. P. R. Crowley and A. S. Kitzes. May 13, 1954. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Values of thermal conductivity, heat capacity, density, and viscosity of thorium oxide slurries are tabulated as functions of temperature and Th concentration. (B.J.H.)

ANALYTICAL PROCEDURES

9726 AECD-4194
Tennessee Eastman Corp., Oak Ridge, Tenn.
ANALYTICAL PROCEDURE FOR DETERMINATION OF TUBALLOY [URANIUM] IN SOLID SALVAGE RESIDUES. William R. Lasko and C. D. Susano. Jan. 24, 1946. Decl. Feb. 13, 1956. 7p. Contract W-7401-eng-23. (C-3.360.8). $1.80(ph OTS); $1.80(mf OTS).

Test results indicate that the hydrofluorination method for the analysis of U in solid salvage residues yields satisfactory results with a high degree of accuracy; while a modification of the procedure gives good results in approximately half the time. Two other procedures for the determination of U in highly siliceous residues were used in these studies for comparing the results; however these are only briefly considered. (auth)

9727 AECU-3214
Sandia Corp., Albuquerque, N. Mex.
A NON-DESTRUCTIVE TEST FOR THE IDENTIFICATION OF CADMIUM PLATING. W. B. Leslie. June 26, 1953. 5p. (TM-70-53-15). $1.80(ph OTS); $1.80(mf OTS).

A simple non-destructive chemical method for the identification of Cd plating is presented. The test requires no special techniques or equipment and may be conducted in less than fifteen seconds. (auth)

9728 BBC-44
Brush Beryllium Co., Cleveland.
BERYLLIUM OXIDE IN SINTERED BERYLLIUM. Progress Report [for] March 1949. C. G. Hoffman. Decl. Feb. 7, 1956. 13p. $3.30(ph OTS); $2.40(mf OTS).

An investigation was carried out to determine the quantity and mode of occurrence of BeO in sintered and in vacuum cast Be. Experimental procedures are outlined. (J.E.D.)

9729 CF-53-12-117
Oak Ridge National Lab., Tenn.
HYDROFLUORIC ACID CONCENTRATION BY ELECTRODIALYSIS. E. J. Parsi. Dec. 16, 1953. Decl. Feb. 9, 1956. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A basis is provided for comparing electrodialysis and vapor distillation as methods for concentrating the 1.6M HF solution resulting from electrolytic reduction of UO_2F_2 to UF_4 to 7M concentration in the Excer process. (F.S.)

9730 MonH-218
[Clinton Labs., Oak Ridge, Tenn.]
PROCEDURE FOR THE DETERMINATION OF PLUTONIUM IN HUMAN URINE. L. B. Farabee. Apr. 11, 1947. Decl. Jan. 10, 1956. 17p. Contract W-35-058-eng-71. $3.30(ph OTS); $2.40(mf OTS).

A method is described for the analysis of plutonium in human urine. The procedure involves a direct precipitation of bismuth phosphate from urine; dissolving of the bismuth phosphate precipitate and re-precipitation of bismuth phosphate; a regular LaF_3 precipitation; oxidation of organic matter, and a final LaF_3 precipitation. The method gives a yield of 93.9% ± 2.4% and separation from uranium is excellent. Routine analysis can be easily carried out and only one transfer is required in the procedure. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

9731 LA-1325
Los Alamos Scientific Lab., N. Mex.
THE CRYSTAL STRUCTURE OF GAMMA PLUTONIUM.

W. H. Zachariasen. Sept. 1951. Decl. Mar. 15, 1956. 11p. Contract W-7405-eng-36. $0.15(OTS).

Gamma Pu is found to be orthorhombic with eight atoms in a unit cell of dimensions (at 226°C) $a_1 = 3.1518$ kX, $a_2 = 5.7800$ kX, $a_3 = 10.142$ kX. The calculated density if 17.13. The space group is Fddd and the positions of the eight atoms are: (0 0 0) (0 1/2 1/2) (1/2 0 1/2) (1/2 1/2 0) (1/4 1/4 1/4) (1/4 3/4 3/4) (3/4 1/4 3/4) (3/4 3/4 1/4). Each Pu atom is bonded to ten others at an average distance of 3.152 kX, four being at 3.020 kX, two at 3.152 kX and four at 3.285 kX. The coefficients of thermal expansion are found to be $\alpha_{180} = -22.5 \times 10^{-6}$, $\alpha_{310} = +47 \times 10^{-6}$, $\alpha_{500} = +94 \times 10^{-6}$. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

9732 NYOO-63
[New York Operations Office, AEC.]
REPORT ON DEUTEROCARBONS. Report No. 4. E. Charney. May 1949. Decl. Apr. 5, 1956. 7p. Contract AT-30-1-Gen-292. $1.80(ph OTS); $1.80(mf OTS).

Several methods (e.g., Fischer synthesis reaction) were suggested for the preparation of high-molecular weight deuterocarbons. These compounds could possibly be used as reactor reflectors or moderators. (C.W.H.)

FLUORINE AND FLUORINE COMPOUNDS

9733 A-3972
Purdue Research Foundation, Lafayette, Ind.
FINAL REPORT. PART I. THE PREPARATION OF CERTAIN FLUORINE CONTAINING COMPOUNDS. Period covered May 1, 1943 to December 31, 1944. PART II. REMOVAL OF ETHER PEROXIDES FROM DIETHYL ETHER USED IN AN EXTRACTION PROCESS. Period covered January 1, 1945 to June 30, 1946. Decl. Jan. 17, 1950. 64p. Contract W-7405-eng-74. $10.80(ph OTS); $3.90(mf OTS).

A study was made of reactions leading to the preparation of fluoroörganic compounds by procedures requiring little or no elemental fluorine and of the preparation of a fluoroïube by vapor-phase fluorination. The preparation of certain volatile fluorine-containing compounds was studied. Procedures for the determinations of Cl_2, F_2, H_2, and C in polyhalo compounds were developed. The safety features of solvent extraction of U(IV) dioxynitrate using ethers were investigated. (F.S.)

GRAPHITE

9734 AECD-3915
[United Carbon Products, Inc., Bay City, Mich.]
PROCESSING TESTS IN GRANULAR RESISTANCE FURNACES FOR PREPARING HIGH PURITY GRAPHITE. G. T. Sermon. Mar. 1, 1948. Decl. Dec. 8, 1955. 19p. (UCP-14). $3.30(ph OTS); $2.40(mf OTS).

Further trial runs in the granular resistance processing furnaces, wherein actual processing was carried out, showed that the total ash content of the graphite treated could be brought down to less than 20 ppm, and in most cases, less than 10 ppm. However, the B content still varies between 0.09 to 2.0 ppm; the variables are being considered to determine the reason for inconsistent results. Two runs were made on graphite received from the National Carbon Co., Inc., Morganton, N. C., processed here, and sent to Hanford for functional tests. One run was processed by the original United Carbon Products Co. Inc. process, while in the other run NH_3 was substituted for N_2. The functional results were good in both cases. (auth)

LABORATORIES AND EQUIPMENT

9735 CF-55-10-81
Oak Ridge National Lab., Tenn.
PRESSURE RISE IN CHEMICAL PROCESSING CELL FOLLOWING A RUPTURE OF HIGH PRESSURE EQUIPMENT. H. O. Weeren. Oct. 17, 1955. Decl. Feb. 20, 1956. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A calculation has been made of the rise in pressure which will occur in the chemical processing cell after any major break in the high pressure equipment. It has been found that at least 35 minutes and probably an hour or more will be required for the cell pressure to reach a dangerous level. Since four successive mishaps must occur before the flow into the processing cell could continue more than a few minutes, it was concluded that the probability of such a chain of mishaps is quite remote and that no precautionary measures are needed to guard against excessive cell pressures. (auth)

RADIATION EFFECTS

9736 CC-2871
Chicago. Univ. Metallurgical Lab.
THE PRECIPITATION OF LANTHANUM FROM SOLUTION IN THE PRESENCE OF RADIATION. Problem Assignment Number 320 MLC 2001. R. A. Penneman, J. A. Ghormley, S. Gordon, B. Leaf, and A. O. Allen. Apr. 6, 1945. Decl. Feb. 15, 1956. 8p. Contract W-7401-eng-37. $1.80(ph OTS); $1.80(mf OTS).

In order to anticipate radiation–chemical effects in solutions of active La, various solutions and suspensions containing La were irradiated with an electron beam. Separation of La from Ba by the alcoholic HCl method is not rendered less efficient by radiation, although considerable gas evolution occurs. Suspensions of La as hydroxide and as ferrocyanide are not appreciably solubilized by radiation. $La_2(C_2O_4)_3$ is decomposed by radiation, is partially thrown into solution, and finally dissolves completely when all the excess $(C_2O_4)^{2-}$ in the solution has been destroyed. (auth)

SEPARATION PROCEDURES

9737 A-2329(Pt. II)
Brown Univ., Providence. Metcalf Research Lab.
INVESTIGATIONS RELATING TO THE CHEMISTRY OF URANIUM. PART II. INVESTIGATIONS RELATING TO THE USE OF POLYETHERS AS EXTRACTION AGENTS. [Report for the Period] May 1, 1944–March 15, 1946. E. Charles Evers and Charles A. Kraus. May 1, 1946. Decl. Dec. 8, 1955. 289p. (BT-68(Pt. II)). $45.00(ph OTS); $11.10(mf OTS).

A compilation is given of the results of numerous investigations relating to the separation of U^{6+} from aqueous solution by extraction with polyethers. Polyethers investigated are: dibutyl "Cellosolve," $C_4H_9OC_2H_4OC_4H_9$; dibutyl "Carbitol," $C_4H_9OC_2H_4OC_2H_4OC_4H_9$; dibutoxytriethylene glycol, $C_4H_9(OC_2H_4)_3OC_4H_9$; dibutoxytetraethylene glycol, $C_4H_9(OC_2H_4)_4OC_4H_9$. Diethyl ether and methylisobutyl ketone were also studied. The polyethers were specially prepared by Carbide and Carbon Chemicals Corporation and most of them are now available commercially. (auth)

9738 AECD-4117
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE DIBUTYL CARBITOL EXTRACTION PROCEDURE FOR THE SEPARATION OF TUBANYL [UO_2^{2+}] AND PHOS-

PHATE IONS. E. J. Lord, L. J. Andrews, and J. W. Gates, Jr. July 12, 1945. Decl. Feb. 2, 1956. 4p. Contract W-7401-eng-23. (C-1.365.1). $1.80(ph OTS); $1.80(mf OTS).

The effectiveness of back washing the carbitol with ¾ saturated $Ca(NO_3)_2$ solution to lower the phosphate ion concentration in the separation of U was evaluated with other methods by which the simultaneous extraction of phosphate with U may be minimized. Results indicate that the most satisfactory procedure for recovery of U from its phosphate solution is by carbitol extraction from an $Al(NO_3)_3$ saturated solution or from a $Cu(NO_3)_2$ solution containing Fe such the Fe/PO_4 mole ratio is one. Backwashing the carbitol does not seem to be necessary. (F.S.)

9739 AECD-4132

Battelle Memorial Inst., Columbus, Ohio.

PROGRESS REPORT FOR THE MONTH OF OCTOBER 1947. A. E. Bearse, E. J. Center, H. A. Pray, A. C. Richardson, and J. D. Sullivan. Oct. 30, 1947. Decl. Jan. 31, 1956. Contract W-38-094-eng-27. (BMI-JDS-16). $4.80(ph OTS); $2.70(mf OTS).

Progress is reported on ore dressing and pyrometallurgy, phosphate chemistry, and U extraction from shales. (D.E.B.)

9740 AECD-4142

Oak Ridge National Lab., Tenn.

THE USE OF AMINES AS EXTRACTANTS FOR URANIUM FROM ACIDIC SULFATE LIQUORS. A Preliminary Report. K. B. Brown, C. F. Coleman, D. J. Crouse, J. O. Denis, and J. G. Moore. May 27, 1954. Decl. with deletions Jan. 11, 1956. 118p. Contract W-7405-eng-26. $0.60(OTS).

Over 100 different organonitrogen compounds have been examined for their ability to extract U from aqueous solutions, particularly sulfate solutions, of the types usually encountered in U ore processing. The more promising of these have been examined further with respect to other characteristics essential to practical application, especially selectivity for U, reagent loss to the aqueous phase, compatibility with practicable diluents, maintenance of adequate extraction power over a range of liquor compositions, and compatibility with practicable stripping methods. Most of the compounds originally considered have been found worthy of only cursory examination. The important outcome on the other hand is that several compounds, specifically several long chain secondary and tertiary amines have been identified as having considerable promise for practicable solvent extraction application. (auth)

9741 AECD-4146

Mound Lab., Miamisburg, Ohio.

SEPARATION OF POLONIUM FROM BISMUTH BY DISTILLATION. R. W. Endebrock and P. M. Engle. Aug. 1, 1953. Decl. with deletions Nov. 30, 1955. 42p. Contract AT-33-1-GEN-53. $0.30(OTS).

The experimental work on the separation of Po from Bi by distillation during the period from 1949 to 1952 is reviewed. Data are presented showing operation of simple batch stills and of fractionating stills with and without He sparging. The problem of materials of construction is discussed and data obtained while working on this phase of the project are included. Some of the problems of still design and construction are presented with recommendations for their solution. (auth)

9742 AECD-4163

Tennessee Eastman Corp., Oak Ridge, Tenn.

RECOVERY OF TUBALLOY [URANIUM] FROM TANTALUM. C. P. Johnston and A. Milch. Sept. 29, 1945. Decl. Feb. 2, 1956. 13p. Contract W-7401-eng-23. (C-0.866.3). $3.30(ph OTS); $2.40(mf OTS).

Methods were worked out for the separation of Ta and U from used Ta filaments. These methods are: hydrofluorination, fluorination, hydrochlorination and dissolution in $HF-HNO_3$, $HF-HCl$ mixture, and HF acid alone. Of these methods hydrofluorination is the best. This process transforms the Ta into TaF_4 and the U to UF_4. The TaF_4 being much more volatile sublimes out of the reaction vessel while the U remains behind as the non volatile UF_4. The UF_4 is purified by dissolving it in a mixture of NH_4OH and 30% H_2O_2 in the cold. The solution is then acidified with HNO_3, filtered, and the U precipitated as ammonium and subsequently ignited to U_3O_8. The Ta is recovered by dissolving the TaF_4 in water and adding NH_4OH. The TaH_4 is filtered off, washed and ignited to TaO_5. (auth)

9743 CF-53-8-173

Oak Ridge National Lab., Tenn.

THOREX: VALVE TEST FOR STEAM SERVICE (TAYLOR NO. 1V67804 AND MINNEAPOLIS-HONEYWELL No. V053E). G. A. West. Aug. 25, 1953. Decl. Feb. 6, 1956. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An evaluation study to determine wear and corrosion in steam service, leakage in steam condensate service, cost comparison, operability of Skinner Electric Solenoid valves, and recommendations of remotely operating valves proposed for use in the Thorex pilot plant to throttle steam or water to jets and tank jackets revealed no erosion or excessive wear rings. Leakage tests showed the Taylor valve to be superior and continued operation did not affect leakage in any of the valves tested. Cost recommendations are made. (F.S.)

9744 CF-55-2-146

Oak Ridge National Lab., Tenn.

ORE PROCESSING: RESIN TEST LOOP STUDIES—PROBLEM STATEMENT. J. C. Bresee. Feb. 18, 1955. Decl. Feb. 20, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A problem is outlined to study the factors affecting resin attrition in a Higgins column, the performance of column components, and the hydrodynamics of cocurrent-resin-pulp flow. (F.S.)

9745 CF-55-9-55

Oak Ridge National Lab., Tenn.

RAW MATERIALS ECONOMIC STUDIES: A PRELIMINARY ESTIMATE OF THE COST OF AMINE EXTRACTION—SODIUM CHLORIDE STRIP. B. B. Klima and R. R. Wiethaup. Sept. 15, 1955. Decl. Feb. 20, 1956. 26p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

9746 CN-3668

Argonne National Lab., Lemont, Ill.

AN EARLY MACRO SCALE DEMONSTRATION OF THE BISMUTH PHOSPHATE EXTRACTION AND DECONTAMINATION PROCEDURE AT PRODUCTION PLANT CONCENTRATIONS OF PLUTONIUM. S. Peterson. Nov. 6, 1946. Decl. Feb. 15, 1956. 5p. Contract W-31-109-eng-38. $1.80(ph OTS); $1.80(mf OTS).

The extraction and decontamination procedures of the Bismuth Phosphate Process were demonstrated on a 0.5 ml scale using anticipated plant concentrations of Pu and fission product elements. Less than 40% loss of Pu occurred in the initial separation from U and one oxidation-reduction cycle. (F.S.)

9747 HW-10960

Hanford Works, Richland, Wash.

CLARIFICATION OF REDOX FEED (1AF) BY FILTRATION. A Semi-Works Study Progress Report. Redox

Technical Data Study No. 8. V. R. Cooper and E. M. Coleman. Oct. 15, 1948. Decl. Feb. 2, 1956. 25p. Contract [W-31-109-eng-52]. $6.30(ph OTS); $3.00 (mf OTS).

9748 HW-26113

[Hanford Works, Richland, Wash.]

REMOVAL OF IODINE VAPOR FROM GAS STREAMS BY SORPTION ON CHARCOAL. J. W. Finnigan, R. E. Peterson, H. W. Lefevre, J. W. Culvahouse, and W. J. Friesen. Nov. 4, 1952. 12p. Contract [W-31-109-eng-52]. $3.30 (ph OTS); $2.40(mf OTS).

Three methods for measuring the I_2 which passes through a charcoal trap in a stream of He are discussed. The first two methods indicated small I_2 transmission through the trap, but were not sensitive enough to detect one part in 10^5 under the desired flow conditions. The third method indicated that less than one part in 10^7 of the initial I_2 passed through the trap at room temperature. It was also shown that the I_2 was stopped in the first few millimeters of trap length and was not appreciably eluted even when the flow rate was increased by a factor of 20 and the charcoal was heated to about 80°C. (auth)

9749 HW-32461-TH

Hanford Atomic Products Operation, Richland, Wash.

THE APPLICATION OF SOME ION EXCHANGE THEORIES TO THE ADSORPTION OF TRACE ELEMENTS. Herman Schuyler Gile. June 1955. Decl. Feb. 20, 1956. Contract [W-31-109-eng-52].

A thesis submitted to Oregon State College in partial fulfillment of the requirements for the degree of Master of Science. $7.80(ph OTS); $3.30(mf OTS).

Breakthrough curves and distribution ratios were obtained experimentally for the adsorption of Pu^{4+}, Cs, Sr, and Ce as trace elements from a $UO_2(NO_3)-HNO_3$ matrix system onto Dowex-50 resin at several column lengths and flow rates. The exchange zone method of Michaels, the plate theory of Hermann, Mayer, and Thompkins, and the kinetic diffusion design theory of Vermuelen and Hiester which were applied to the data obtained involve an equilibrium parameter which is the distribution ratio and a kinetic parameter which is related to the height of a transfer unit. The parameters were calculated for each of the breakthrough curves. All 3 theories gave similar results for a given case; differences which were noted seemed to be related to the magnitude of the distribution ratio. The height of a transfer unit was independent of the flow rate when the distribution ratio was moderate; when the distribution ratio was large, the height of a transfer unit was dependent on flow rate and in most cases the resin was not completely utilized. (auth)

9750 MITG-A31

Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.

THE DESIGN OF A COMBINATION-PROCESS MILL. Charles Leroy Sollenberger. May 23, 1947. Decl. Apr. 11, 1956. 56p. $9.30(ph OTS); $3.60(mf OTS).

The design, operation, cost, and manpower requirements of a 200-ton/day ore processing plant are given. (D.E.B.)

9751 MITG-A35

Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.

ELECTROLYTIC PRECIPITATION OF URANIUM FROM AQUEOUS SOLUTIONS. Eugene Joseph Michal. Sept. 12, 1947. Decl. Apr. 11, 1956. 60p. $0.40(OTS).

The use of electrolysis for recovery of U from pure sulfate solutions was studied with a view toward its application to leach liquors from U ores. These leach liquors are relatively dilute, containing less than one g of U per liter, and precipitation tests described in this thesis were made on solutions of UO_2SO_4 of approximately this concentration. Three series of precipitation tests consisted of direct precipitation of U into a Hg cathode to form U amalgam, precipitation of a compound of U, in a cell with a single electrolyte, in the catholyte of a diaphragm cell, and in the anolyte of a diaphragm cell, and reduction of uranyl ion to uranous ion in solution in an electrolytic cell, followed by chemical precipitation of uranous ion as a F compound of U. (auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

Refer to abstract 9731.

URANIUM AND URANIUM COMPOUNDS

9752 AECD-4006

Tennessee Eastman Corp., Oak Ridge, Tenn.

THE REDUCTION OF URANIUM TRIOXIDE BY ETHYL ALCOHOL. B. M. Haines and V. P. Calkins. Nov. 18, 1946. Decl. Jan. 5, 1956. 15p. Contract W-7401-eng-23. (H-8.385.9). $3.30(ph OTS); $2.40(mf OTS).

The effect of temperature upon the rate of reduction of UO_3 by ethyl alcohol was investigated, and a comparison of the reactivity of the dioxide produced at various temperatures was made. The per cent of C in the end product has been studied with respect to both temperature of reduction and length of exposure to alcohol. Optimum conditions for the reduction have been suggested. (auth)

9753 AECD-4141

[Battelle Memorial Inst., Columbus, Ohio.]

PROGRESS REPORT FOR THE MONTH OF DECEMBER 1947. A. E. Bearse, F. C. Croxton, and J. D. Sullivan. Dec. 31, 1947. Decl. Jan. 26, 1956. 6p. Contract AT-30-1-gen-202. (BMI-JDS-2). $1.80(ph OTS); $1.80 (mf OTS).

Research is reported on U recovery from shales by acid leaching and the recovery of U from dilute aqueous solutions by the use of organic precipitants or solvent-extractable organic U compounds. (F.S.)

9754 AECD-4183

Tennessee Eastman Corp., Oak Ridge, Tenn.

MODIFIED LIQUID PHASE REACTOR. J. W. Zuidema and A. E. Ballard. June 23, 1944. Decl. Feb. 15, 1956. 5p. (CD-BETA-S-517). $1.80(ph OTS); $1.80(mf OTS).

A modified liquid phase Kraus type reactor was described and details of the operation for conversion of UO_3 and U_3O_8 to UCl_4 are given. (F.S.)

9755 AECD-4216

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

EVALUATION OF SAMPLING VARIABLES—VESSEL C-102. H. B. Loopstra, F. H. Tingey, and F. P. Vance. Sept. 3, 1954. Decl. Feb. 20, 1956. 11p. Contract AT(10-1)-205. (CPP-54-82). $3.30(ph OTS); $2.40(mf OTS).

To determine the optimum procedure for sampling the coarse-feed tank of the NPR and MTR process, a systematic series of tests was conducted to measure the extent of solution stratification and effect of air-sparging as a means of vessel homogenization. The solution was not homogeneous before sparging for 45 minutes. The most precision is afforded by compositing aliquots from each sample and performing one analysis. (F.S.)

9756 CN-2491

[Chicago. Univ. Metallurgical Lab.]

EQUILIBRIUM DISTRIBUTION AND PHYSICAL PROPERTIES FOR THE SYSTEM URANYL NITRATE–DIETHYL

ETHER–WATER. Progress Report. Marion Monet. Dec. 18, 1944. Decl. Feb. 14, 1956. 36p. Contract W-7401-eng-37. $6.30(ph OTS); $3.00(mf OTS).

Physical and chemical properties and a critical evaluation of the equilibrium distribution of the uranyl nitrate–diethyl ether–water system are given. (F.S.)

9757 M-1047
Brown Univ., Providence, R. I.
THERMAL DECOMPOSITION OF HYDRATED RO_4. Charles A. Kraus. Apr. 19, 1944. Decl. Jan. 27, 1956. 3p. (BM-7). [Monthly] Report No. 7. $1.80(ph OTS); $1.80(mf OTS).

9758 M-2103
Purdue Univ., Lafayette, Ind.
THE PREPARATION AND REACTIONS OF CERTAIN COMPOUNDS OF TUBALLOY [URANIUM]. Monthly Technical Report [for] March 1, 1945 to April 1, 1945. E. T. McBee and Z. D. Welch. Decl. Jan. 27, 1956. 19p. Contract W-7405-eng-74. $3.30(ph OTS); $2.40(mf OTS).

The preparation of UCl_4 by the reaction of UO_3 with $SOCl_2$, SCl, and C_3Cl_2 was described. The identification and recovery of U from carbon electrodes and electrode ash were investigated. Analytical procedures for the determination of U in acid solutions, carbon electrodes, and electrode ash are described. (C.W.H.)

9759 RL-4.6.910
[California. Univ., Berkeley. Radiation Lab.]
TEMPERATURE EFFECTS OF SUBLIMATION. TCl_4. [UCl_4]. M. Mueller, P. H. Davidson, and Iva Streeter. Feb. 12, 1945. Decl. Sept. 15, 1955. 11p. Contract W-7405-eng-48. $3.30(ph OTS).

The temperature lowering at the surface of UCl_4 crystals, caused by the sublimation of the solid, is shown to be insignificant at 400°C and increases exponentially to about 30°C at 500°C. The temperature effects are spread through comparatively large thicknesses of the solid on account of the transfer of heat through the solid itself. (auth)

9760 RL-4.6.913
[California. Univ., Berkeley. Radiation Lab.]
HEATS OF FORMATION OF TUBALLOY [URANIUM] COMPOUNDS. III. MIXED HALIDES, TCl_2Br, TCl_2Br_2, AND $TClBr_2$. C. H. Barkelew. Apr. 23, 1945. Decl. Sept. 15, 1955. 4p. Contract W-7405-eng-48. $1.80 (ph OTS).

The heats of formation at 0°C of several tetravalent mixed halides have been determined from their heats of solution. The values found were as follows: UCl, Br, $\Delta H = -251.9 \pm 0.6$ K cal/mole; UCl_2Br_2, $\Delta H = -241.2 \pm 0.6$ K cal/mole; $UClBr_2$, $\Delta H = -231.7 \pm 0.6$ K cal/mole. (auth)

9761 RL-4.6.934
[California. Univ., Berkeley. Radiation Lab.]
THE VAPOR PRESSURE, MOLECULAR DIAMETER, VISCOSITY, AND MEAN FREE PATH OF TUBALLOY TETRACHLORIDE. SUMMARY OF DATA PERTAINING TO THE VAPORIZATION OF OTHER TETRAHALIDES OF TUBALLOY. Manfred E. Mueller. Sept. 18, 1945. Decl. Sept. 15, 1955. 28p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

The reported data on the vapor pressure of UCl_4 are reviewed and extended with new measurements on both orifice and tube flow. It is shown that the best equation for the vapor pressure of the solid to 505°C. is $\log P_{mm} = -10427/T + 13.2995$, for which the calculated heat of sublimation is 47.7 Kcal/mol. The equation holds for solids prepared in 3 different ways. It was not found possible to bring the data obtained by a transpiration method in line with those obtained by effusion or tube flow. Coherent thermodynamic, thermal, and kinetic values are tabulated. The molecular diameter of the molecule is found to be 5.6×10^{-8} cm., and the viscosity 288 micropoises at 500°C. It is suggested that liquid UCl_4 is highly associated, as concluded from an exceptionally high Trouton's constant. Comparable data on 7 other tetrahalides are tabulated and shown to be similar to those obtained for UCl_4, though on the whole resembling UBr_4 slightly more. (auth)

WASTE DISPOSAL

9762 CE-2674
[Chicago. Univ. Metallurgical Lab.]
DEVELOPMENT OF EQUIPMENT FOR DETECTION OF ATMOSPHERIC XENON. S. A. Kline. Jan. 19, 1945. Decl. Feb. 14, 1956. 21p. Contract W-7401-eng-37. $4.80(ph OTS); $2.70(mf OTS).

A process and equipment, for determining whether the concentration of Xe^{133} which escapes from the stacks at ORNL constitutes a health hazard, were developed. The separation unit had an efficiency of about 40% while that of the collecting and separation units combined was about 20%. (F.S.)

9763 HW-37519
Hanford Atomic Products Operation, Richland, Wash.
STRUCTURAL EVALUATION OF UNDERGROUND WASTE STORAGE TANKS. Edgar F. Smith. June 23, 1955. 39p. Contract [W-31-109-Eng-52]. $0.30(OTS).

Present waste storage tanks were analyzed in accordance generally with the rational approach of the Portland Cement Association for circular concrete tanks. Certain basic assumptions were made, relating to load conditions, temperature effects and increased allowable unit stresses. The reinforcing steel was permitted to approach a tensile stress of 20,000 psi for sustained hydrostatic pressures and 27,000 psi when transient vapor pressures were imposed in addition to the liquid loading. This compares with a normal design stress of 14,000 psi. On the basis of these assumptions, limiting values of effective specific gravity and vapor pressure within the tanks have been estimated and plotted graphically. The maximum effective specific gravity and simultaneous allowable internal vapor pressure for liquid wastes at elevated temperatures in each of the present tank farm types was summarized. When specific gravity is reduced an increased vapor pressure would be permitted up to a limit of 10 psig beyond which the dome of the tank would be in jeopardy. Although actual structural collapse due to hydrostatic head is difficult to conceive, it is believed that the limiting values presented cannot be exceeded without endangering the integrity of the structure from the standpoint of splitting open and permitting leakage through wide cracks. (auth)

ENGINEERING

9764 CF-55-12-72
Oak Ridge National Lab., Tenn.
ZIRCALOY-TO-STAINLESS STEEL TRANSITION PIPE JOINT DESIGN STUDY. C. L. Segaser. Dec. 5, 1955. 32p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00 (mf OTS).

A design survey collecting data and procedures to the Zircaloy-to-stainless steel transition pipe joints for 2-region homogeneous reactors was made. An analysis of gasket and bolting stresses consisted of measurements of gasket factors, elastic and creep properties of gasket material, and similar data on bolting stresses. (F.S.)

HEAT TRANSFER AND FLUID FLOW

9765 AECD-4084
Tennessee Eastman Corp., Oak Ridge, Tenn.
GASEOUS FLOW. C. E. Normand. Aug. 27, 1946. Decl. Nov. 29, 1955. 82p. Contract W-7401-eng-23. (D-4.440.8). $0.50(OTS).

The flow of gases through pipes, orifices, and flares were investigated for conditions of laminer and molecular flow and for the transition region between laminar and molecular flow. Practical equations for the design of vacuum systems were formulated. Formulas for air flow through leaks and capillaries and the sensitivity limitations on bubble methods of leak hunting were also developed. (auth)

9766 CF-51-10-130
[Oak Ridge National Lab., Tenn.]
DESIGN OF SMOOTHLY FLOWING GAS AND LIQUID MIXTURES. C. D. Zerby. Oct. 11, 1951. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The several types of flow mechanisms possible in two-phase flow are defined and their order of occurrence given at a constant liquid flow rate and increasing gas flow rates. The characteristics of two-phase flow, which cause variable conditions in the flow stream, are described. Experimental data are presented which provide a basis for design of a smoothly operating two-phase system. The favorable characteristics of orifice in a two-phase flow stream are described, and the pressure drop equation across an orifice for two-phase flow is developed. An example of the proper use of the included data is given. (auth)

9767 CF-55-3-119
Oak Ridge National Lab., Tenn.
HEAT REMOVAL SYSTEMS FOR THE HRT PRESSURE VESSEL. R. E. Aven. Mar. 14, 1955. Decl. Feb. 20, 1956. 33p. Contract [W-7405-eng-26]. $0.30(OTS).

The thermal stress and the rate of heat removal from each surface of the pressure vessel wall as a function of temperature difference were determined by using the temperature distribution equation. The total maximum stress was found by adding to the thermal stress, the stresses produced by the reactor design pressure and the expansion of the stainless steel cladding. It is recommended that the pressure vessel be cooled by circulation of cooling water through coils welded to the outside surface. (F.S.)

9768 CF-55-5-200
Oak Ridge National Lab., Tenn.
THE FLOW OF A FLASHING MIXTURE OF WATER AND STEAM AT HIGH PRESSURES. P. N. Haubenreich. May 16, 1955. 94p. Contract W-7405-eng-26. $0.50(OTS).

Unsteady flow of a flashing mixture of water and steam under saturation pressures as high as 1250 psia was studied for valve and pipe designing. Pressure drop and mass flow rate data were analyzed to determine friction factors for pipes. Properties for constant enthalpy expansion are sufficiently accurate for calculating flow rates and pressure drops. Tables of properties of water expanded isenthalpically from saturated liquid at several pressures are included. (F.S.)

9769 KAPL-M-CEL-1
Knolls Atomic Power Lab., Schenectady, N. Y.
REPORT ON STUDY OF VARIOUS ELECTRICAL ANALOGUE TECHNIQUES FOR SOLVING TRANSIENT HEAT CONDUCTION PROBLEMS. Clevis E. Linkous. [1957]. 28p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

9770 KAPL-M-SCT-4
Knolls Atomic Power Lab., Schenectady, N. Y.
FREE CONVECTION THROUGH PARALLEL RISERS. F. C. Steiner. June 1, 1955. 20p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

Preliminary data, demonstrating the manner in which free convection distributes flow between parallel risers having unequal heat generation, cover that phase of the tests in which steady-state data were obtained when applying heat to two parallel risers of equal cross sectional areas. It was found that temperatures at the top varied by less than 25°F or about 5% of the outlet temperature when applying heat differing by a factor up to 8, to the risers. (F.S.)

9771 KAPL-M-WAB-1
Knolls Atomic Power Lab., Schenectady, N. Y.
TECHNICAL STUDY OF GAS ENTRAPMENT IN ORIFICES AND IN VERTICAL PASSAGES. W. A. Boothe. Nov. 13, 1953. 43p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30(mf OTS).

Mathematical analyses are made of gas bubble entrapment in flow systems for the cases where the bubbles are in a downward flowing section of the loop, pass through flat plate orifices, or pass through slots in flat plates. Included in appendices are conversion of drag coefficient curves, data on the check on bubble drag, force balances on bubbles of various shapes, and minimum pressures for bubbles. (B.J.H.)

MATERIALS TESTING

9772 AECD-4233
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
THE DECAY OF INDUCED ACTIVITY IN PORTLAND, BARYTES, AND BROOKHAVEN CEMENTS. W. H. Bowman, D. L. James, and J. D. Roarty. Aug. 23, 1950. Decl. Feb. 8, 1956. 26p. For Carbide and Carbon Chemicals Div., K-25 Plant. Contract [W-7405-eng-26, Subcontract 70]. (KT-85). $4.80(ph OTS); $2.70(mf OTS).

The Portland cement has the least induced activity of the cements tested and the absorption coefficient is nearly as high as that of barytes. The former is the best suited of the three samples with respect to a low induced activity. If the 47-day isotope found in the Brookhaven cement, which is probably Fe, can be economically eliminated, this cement will be preferable to either of the others. The majority of the active materials appear to be present in trace amounts with the possible exception of Fe in the Brookhaven cement, and their elimination will probably prove difficult. (auth)

9773 CF-54-3-22
Oak Ridge National Lab., Tenn.
HYDROFLUORIC ACID CONCENTRATION BY ELECTRODIALYSIS — LIFE TEST OF UNIT. E. J. Parsi. Mar. 5, 1954. Decl. Feb. 9, 1956. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

After 720 hours of operation under current and 1100 hours total immersion time in 1.5 – 2.0M hydrofluoric acid there was no serious deterioration to Nepton CR-51 cation membranes, Dynel-supported anion membranes, rubber-styrene spacers and platinum electrodes in a hydrofluoric acid concentration electrodialysis unit. (auth)

9774 KAPL-M-AJH-2
Knolls Atomic Power Lab., Schenectady, N. Y.
LEAK TESTING OF TYPE 347 STAINLESS STEEL WELDS. W. L. Fleischmann and A. J. Herd. Oct. 25, 1955. 4p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Four types of Arcos Type 347 stainless steel metal arc electrodes, each with a different ferrite content, were

deposited and the weld beads tested for leaks with a GE mass spectrometer Type M leak detector. None of these allowed He gas to pass through a sound weld of a thickness of 0.030 in. or more during a test period of one half hour. (F.S.)

PUMPS

9775 CF-53-9-199
[Oak Ridge National Lab., Tenn.]
PULSAFEEDER DIAPHRAGM STUDIES. Paul N. Stevens. Sept. 24, 1953. 12p. Contract [W-7405-eng-26]. $3.30 (ph OTS); $2.40(mf OTS).

An analysis is made of the relationship existing between the head contour design, diaphragm dimensions, and the resulting stresses due to a full deflection conforming to the head contour of pulsafeeder pumps. Such a relation would allow the prediction of the optimum diaphragm and contour designs for future pulsafeeders. (F.S.)

9776 KAPL-M-SCT-8
Knolls Atomic Power Lab., Schenectady, N. Y.
MARK B PUMP CLEANING REPORT. R. Demers. Oct. 7, 1955. 12p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Sodium cleaning of the Mark B Pumps was successfully completed without incident. However, an additional step, (a tri-$NaHPO_4$ flush) had to be incorporated into the cleaning procedure to remove an oily-type film which was deposited after Na cleaning. This T.S.P. did not remove all of the residue and localized swabbing with acetone on all accessible parts of the pump interior was necessary. Analysis of the residue indicated that the oily film could have been deposited by the methyl isobutyl ketone, one of the cleaning agent's constituents. The ketone apparently undergoes a condensation reaction to form a water insoluble soap-like compound. In view of the above, SIR Systems Development has suggested that an alcohol which does not contain this constituent be employed in future pump cleaning operations. If the oil film deposit is still evident after the use of absolute alcohol, it is suggested that the final water rinse be followed by a cold acetone flush in place of the T.S.P. solution. This would ensure maximum cleanliness of the inaccessible expansion joint. Residual acetone could be readily removed by hot gas purging. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

9777 HW-40087
Hanford Works, Richland, Wash.
BRONZE FURNACE HISTORY 313 BUILDING. Thomas B. Correy. Feb. 6, 1951. 31p. Contract [W-31-109-eng-52]. $6.30(ph OTS); $3.00(mf OTS).

A study of the number of element failures in the salt bath furnace showed that changes had to be made in the furnace to correct the difficulties. An insulated cover and a flange crucible prevented destruction from scale and flux spillage. An element support of porcelain protected the bottom of the element and lead failures were stopped with porcelain sleeves. (F.S.)

CERAMICS AND REFRACTORIES

9778 AECU-3218
Sandia Corp., Albuquerque, N. Mex.
SOME PRELIMINARY CONSIDERATIONS CONCERNING THE EXPECTED OVER-ALL EXPANSION OF BARIUM TITANATE CERAMIC. D. C. Kleinecke. Feb. 7, 1955. 15p. (TM-20-55-51). $3.30(ph OTS); $2.40(mf OTS).

A preliminary mathematical study is made of the maximum expected expansion of barium titanate ceramic. It is noted that there is insufficient physical evidence for a complete answer, and some possible mathematical models are discussed and compared. (auth)

9779 ANL-4241
Argonne National Lab., Lemont, Ill.
THE THERMAL EXPANSION OF HIGH DENSITY BERYLLIA SHAPES. J. G. Malm and J. R. Gilbreath, June 1, 1949. Decl. Jan. 6, 1956. 17p. Contract W-31-109-eng-38.

Work done by J. A. Crawford in Feb. 1946, Metallurgical Lab., Univ. of Chicago. $3.30(ph OTS); $2.40(mf OTS).

The linear thermal expansion coefficients were measured from 25 to 1000°C for 2 BeO_2 rods having densities of ca. 2.8 g cm^{-3}. (F.S.)

9780 CT-3528
Chicago. Univ. Metallurgical Lab.
INVESTIGATIONS OF THE STRUCTURAL PROPERTIES OF FABRICATED BERYLLIA FOR THE HIGH-TEMPERATURE OXIDE PILE. J. R. Gilbreath and S. R. Gaarder. May 20, 1946. Decl. Feb. 2, 1956. 22p. Contract W-7401-eng-37. $4.80(ph OTS); $2.70 (mf OTS).

Data on the shrinkage, compressive and tensile strength, and the resistance to thermal spalling of beryllia shapes are reported. Hot pressed beryllia pieces expand slightly on prolonged heating in air of N_2. Changes in density for different shapes can not be predicted quantitatively but changes are more gradual in heating in N_2. Cold compressive strength of hot-pressed beryllia is $\sim 1.0 \times 10^{10}$ dynes/cm^2 and tensile strength 1.1×10^9 dynes/cm^2. Hexagonal beryllia bricks may be heated to 1500°C and cooled at a rate of at least 10°/min without outward signs of failure. Bricks annealed at 1750°C are more resistant to thermal spalling and cracking. (F.S.)

CORROSION

9781 CF-51-5-37
[Oak Ridge National Lab., Tenn.]
CORROSION NEWSLETTER NO. 2. J. L. English. May 3, 1951. Decl. Feb. 4, 1956. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The corrosion behavior of HNO_3-pretreated stainless steel in 250°C UO_2SO_4 was investigated. (D.E.B.)

9782 CF-51-9-40
[Oak Ridge National Lab., Tenn.]
CORROSION NEWSLETTER NO. 5. J. L. English. Sept. 6, 1951. Decl. Feb. 9, 1956. 26p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The corrosion behavior of 347 stainless steel in UO_2SO_4 at 150°C was investigated. (D.E.B.)

9783 CF-53-12-31
Oak Ridge National Lab., Y-12 Area, Tenn.
THE USE OF POTASSIUM DICHROMATE AS AN INHIBITOR OF CORROSION OF MILD STEEL IN THE TERNARY SYSTEM, PDA—BENZENE—WATER. C. D. Susano. Dec. 7, 1953. Decl. Feb. 9, 1956. 8p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Test results reported reveal that potassium dichromate in very low concentrations is quite satisfactory for all practical purposes as an inhibitor of corrosion of mild steel in the ternary system, PDA- benzene—water at temperatures near the boiling point of benzene. (F.S.)

9784 HW-27683
Hanford Works, Richland, Wash.
ROUND ROBIN TESTS TO COMPARE ELECTROLYTIC OXALIC ACID ETCH WITH BOILING NITRIC ACID TEST AS IN DESIGNATION A-262-44T FOR EVALUATION OF STAINLESS STEEL. N. Endow. Feb. 25, 1953. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The results of the oxalic acid etch test and the boiling nitric acid test for corrosion of austenitic stainless steel show that the stainless steel specimens can be correctly screened from the boiling nitric acid test. The specimens which failed the oxalic acid test also failed the boiling nitric acid test. (F.S.)

9785 KAPL-M-EGB-16
Knolls Atomic Power Lab., Schenectady, N. Y.
ALUMINUM BEARING ALLOYS IN SODIUM. Report No. 2 ON EVALUATION OF THE BEHAVIOUR OF ALUMINUM IN SODIUM. Problem No. 28. E. G. Brush. Apr. 6, 1954. 15p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Simulated bearing tests have shown that certain Al base alloys have attractive bearing properties for service in Na and NaK. Previous corrosion tests have shown that the behaviour of Al in Na is greatly influenced by the presence of stainless steel. To study this influence under simulated bearing conditions, non-rotating sleeve and journal tests were run in Na at 300, 400 and 500°C. Additional tests were made to determine the solubility of Al in Na as a function of temperature. The tests reaffirm previous findings that at temperatures above 400°C, the high corrosion rate of Al base alloys prohibits their use in Na-stainless steel systems. (auth)

METALS AND METALLURGY

9786 AECD-4008
National Bureau of Standards, Washington, D. C.
THE URANIUM–ZIRCONIUM [BINARY SYSTEM]. Metallurgy Division Final Report. R. W. Buzzard, R. B. Liss, and D. P. Fickle. [nd]. Decl. Jan. 11, 1956. 13p. (NBS-D-116). $3.30(ph OTS); $2.40(mf OTS).

The phase diagram for the U–Zr system within the range 0 to 43 at. % Zr was developed by thermal, metallographic and x-ray techniques. The general form of the diagram appeared to agree with that proposed by Udy. The solubility of Zr in α-Uranium was low, being approximately 2 at. % at room temperature, rising to 6 at. % at 685°C. The β-γ transition was lowered to 685°C at 18.5 at. %. Two horizontals were observed in the system, one at 685°C and the other at 610°C. Above 685°C a continuous solid solution between beta-Zr and U existed. (auth)

9787 AECD-4177
Tennessee Eastman Corp., Oak Ridge, Tenn.
TANTALUM-RICH ALLOYS OF TUBALLOY [URANIUM]. J. W. Sausville and C. E. Larson. Jan. 15, 1946. Decl. Feb. 16, 1956. 31p. Contract W-7401-eng-23. (C-0.380.2). $4.80(ph OTS); $2.70(mf OTS).

Methods for the manufacture of refractory crucibles for use in high temperature work in general, and in particular for preliminary experiments with the induction furnace to test the action of tantalum on tantalum carbide at 2900°C. are described. At 2900 to 3000°C, tantalum dissolves appreciable quantities of TaC, thereby excluding the use of this refractory as a vessel in which to prepare high-Ta alloys of U. The possible use of other "super-refractories" is discussed. A series of U–Ta alloys covering the range 0 to 20% U was prepared with a specially constructed arc furnace. Photomicrographs of many as cast and annealed samples are shown. At room temperature the solubility of α–U in Ta is found to be approximately 6 per cent. Some evidence is presented for the existence of the compound TaU_2 at room temperature. (auth)

9788 AECD-4228
Knolls Atomic Power Lab., Schenectady, N. Y.
HOT COINING BERYLLIUM. Robert M. Linsmayer and Alan U. Seybolt. Sept. 24, 1948. Decl. Feb. 8, 1956. 21p. Contract W-31-109-eng-52. (MEMO-RML-1). $4.80(ph OTS); $2.70(mf OTS).

Hot coining of beryllium in the neighborhood of 400°C is feasible providing the change in shape required from blank to finished piece is small, as in normal coining operations. Coining should be carried out at a pressure of about 200,000 psi. Temperature of working is not critical, but there is some tendency for loss of formability below 350°C. Lubrication of die and blanks is a critical matter. Oildag appears to be most generally useful, although any method of obtaining an adherent graphite layer would probably serve the purpose. (auth)

9789 BBC-15
Brush Beryllium Co., Cleveland.
FIN TUBE PROJECT AND G. E. WASHER PROJECT PROGRESS REPORT FOR THE PERIOD MAY 1 TO MAY 31, 1948. D. T. Doll. Decl. Feb. 7, 1956. 24p. Contract AT-30-1-Gen-155. $4.80(ph OTS); $2.70(mf OTS).

9790 BBC-18
Brush Beryllium Co., Cleveland.
FIN TUBE PROJECT, G. E. WASHER PROJECT, AND LARGE SINTERED SHAPES PROGRESS REPORT FOR THE PERIOD JUNE 1 TO JUNE 30, 1948. D. T. Doll. Decl. Feb. 7, 1956. 67p. Contract AT-30-1-Gen-155. $10.80 (ph OTS); $3.90(mf OTS).

9791 BBC-39
Brush Beryllium Co., Cleveland.
PRODUCTION OF URANIUM–BERYLLIUM ALLOYS. Progress Report. D. T. Doll. Jan. 20, 1949. Decl. Apr. 9, 1956. 25p. $4.80(ph OTS); $2.70(mf OTS).

Work completed in the production of 2 test cylinders, each 2 cm in diameter and 5 cm long containing 6 g normal U and the rest pure Be is reported. Hot pressing, cold pressing, and sintering under linear end compression was tried. Thus far it has been impossible to secure full compression of the powder. (F.S.)

9792 BBC-54
Brush Beryllium Co., Cleveland, Ohio.
SEPARATION OF HAFNIUM FROM ZIRCONIUM BY MULTIPLE RECRYSTALLIZATION OF AMMONIUM FLUOZIRCONATES (LORAIN OPERATIONS TECHNICAL REPORT). Final Technical Report for Period June 20, 1949 through Aug. 11, 1949–Initial Development Phase; Aug. 11, 1949 through January 25, 1950–Plant Phase. Wallace W. Beaver. Aug. 28, 1950. Decl. Feb. 8, 1956. 85p. Contract AT-(30-1)-714. $0.50(OTS).

Removing Hf from Zr by recrystallization of $(NH_4)_2$ ZrF_6 is feasible under proper conditions and can be adapted to plant scale operations. The economics of the process become undersirable when using high Hf(2.0% Hf/Zr) starting material. Auxiliary processes of ore extraction, chemical purification and oxide production gave better results under plant conditions than predicted as to yield, efficiency, and purification. Corrosion of equipment and instability of the salt due to fluoride depletion and pH increase were the main difficulties found in the process of purifying $(NH_4)_2$ Z_4F_6 by multiple recrystallization. (F.S.)

9793 BMI-1023
Battelle Memorial Inst., Columbus, Ohio.
PHASE RELATIONS IN THE URANIUM–ZIRCONIUM–

OXYGEN SYSTEMS INVOLVING ZIRCONIUM AND URANIUM DIOXIDE. Henry A. Saller, Frank A. Rough, Joseph M. Fackelmann, Arthur A. Bauer, and J. Robert Doig. July 28, 1955. Decl. Apr. 11, 1956. 30p. Contract W-7405-eng-92. $0.25(OTS).

Tentative isothermal sections of a part of the U–Zr–O system have been determined for 1000, 1300, and 2000°F. Uranium dioxide and zirconium solid solutions coexist in equilibrium at each of these temperatures. Alpha Zr in equilibrium with uranium dioxide contains about 28 a/o O, but very little U. Little Zr is soluble directly in UO_2, but extensive solubility exists between UO_2 and ZrO_2. (auth)

9794 CP-1829

[Chicago. Univ.] Metallurgical Lab.

EXTRUSION OF COMPOUND TUBES OF ALUMINUM AND B_4C. E. C. Creutz. July 1, 1944. Decl. Feb. 16, 1956. 9p. Contract [W-7401-eng-37]. (A-2654). $1.80(ph OTS); $1.80(mf OTS).

9795 CT-1349

[Chicago. Univ.] Metallurgical Lab.

ELECTRICAL CONTROLS FOR ARGON SHIELDED ARC WELDING. B. L. Weller. Feb. 11, 1944. Decl. Feb. 14, 1956. 21p. Contract [W-7401-eng-37]. (A-1898). $3.30 (ph OTS); $2.40(mf OTS).

Two types of electrical controls for argon shielded arc welding are described in detail. (B.J.H.)

9796 HW-32424

Hanford Atomic Products Operation, Richland, Wash.

INVESTIGATION OF THE USE OF NITROGEN AS A PURGING GAS FOR WELDING. (Report No. 4) Final Report. E. B. LaVelle. Sept. 3, 1953. 8p. Contract W-31-109-Eng-52.

Included as part of this report are: NITROGEN PURGING FOR WELDING. W. R. Smith and Kenneth L. Sanborn. Oct. 23, 1952; and EXTENDED STUDY OF NITROGEN PURGED STAINLESS STEEL PIPE WELDS. W. R. Smith and Kenneth L. Sanborn. May 26, 1953. $1.80(ph OTS); $1.80(mf OTS).

Nitrogen substituted for A for purging purposes in welding austenitic stainless steels showed a negligible corrosion effect, and the difference in formation of gases from a health hazard standpoint is negligible. Specifications will be changed to permit the use of N_2 for this purpose. (F.S.)

9797 KAPL-M-BMS-1

Knolls Atomic Power Lab., Schenectady, N. Y.

TRANSITION WELDS BETWEEN AUSTENITIC AND FERRITIC STEEL PIPE. B. M. Smith. Aug. 11, 1955. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80 (mf OTS).

Joining austenitic to ferritic steel pipe by welding was investigated through a literature survey. Conditions affecting weld joint failure in high temperature and high pressure steam piping are briefly presented and compared, where applicable, to the SAR conditions. It was recommended that a temperature cycling test be made to prove the serviceability of austenitic to ferritic pipe joints under SAR conditions. (auth)

9798 KAPL-M-JFD-1

Knolls Atomic Power Lab., Schenectady, N. Y.

OBSERVATIONS FROM DILATOMETER CURVES OF AN 80% Zr–20% U ALLOY. J. F. Duffey and W. E. Seymour. June 8, 1954. Decl. Feb. 7, 1956. 4p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Transformation kinetics of 80 wt. % Zr–U alloys were studied by studying the resistivity changes in a precision dilatometer using a He atmosphere. Neither N_2 or O_2 were found to be soluble in the equilibrium phases which exist below 600°C but O_2 solution in the alloy above 615°C causes rupture. The isothermal transformation lines at 595 and 620°C at the high Zr end of the equilibrium diagram encompass a greater temperature range than indicated and occur within a few degrees of 570 and 620°C. (F.S.)

9799 M-4100

[Massachusetts Inst. of Tech., Cambridge.]

PROGRESS (A-1) REPORT FOR MONTH OF SEPTEMBER 1945. Oct. 10, 1945. Decl. Feb. 2, 1956. 15p. Contract W-7405-eng-175. $3.30(ph OTS); $2.40(mf OTS).

The production of Ce_2S_3 and other ceramic crucibles was continued. The melting, casting, and fabrication of Be were investigated. Microstructures and lattice parameters of binary Be alloys are tabulated. Attempts to cast Al–B systems were continued. (C.W.H.)

9800 SEP-32

Sylvania Electric Products Inc., Bayside, N. Y.

SOME EMPIRICAL-THEORETICAL CONSIDERATIONS OF URANIUM NITRIDE IN ZIRCONIUM. Bernard Kopelman. Dec. 21, 1949. Decl. Mar. 7, 1956. 15p. Contract AT-30-1-Gen-366. $0.20(OTS).

Recent interest in the incorporation of U^{235} in zirconium as discrete particles of controlled size has resulted in the development of an apparently successful process. The uranium is used in the form of uranium nitride, whose particle size for one series of samples is 100 microns ± 10%, and for a second series is 10 microns ± 10%. If the uranium becomes atomically dispersed either as solid solution, or as a compound, in the zirconium, the process is unsuccessful. The method is critically examined to obtain a better understanding of the complexities of the system. In addition, a spot test, sensitive to uranium to eight parts per million is described and applied to these samples as proof that the uranium has remained in discrete areas. (auth)

9801 SEP-138

Sylvania Electric Products Inc. Atomic Energy Div., Bayside, N. Y.

INVESTIGATION OF THE POWDER METALLURGY OF THORIUM. PART I. W. G. Lidman and T. Weissman. Dec. 22, 1953. Decl. Jan. 20, 1956. 26p. Contract AT-30-1-GEN-366. (DCF-4441). $0.25(OTS).

An investigation was made of the effect of compacting pressure, sintering time, temperature, and atmosphere on the density, hardness, and microstructures of Th prepared by powder metallurgy. At 1400°C and above, the compacting pressure did not appreciably affect the density of either Metal Hydrides' Th or Th prepared by decomposition of the hydride during sintering. The density of Horizons' Th increased markedly with increased compacting pressure. The highest densities obtained were 11.12 g/cc for Metal Hydrides' powder compacted at 40 tsi and sintered at 1400°C for 1000 min in vacuum; 11.58 g/cc for Horizons' powder compacted at 75 tsi and sintered at 1450°C for 60 min in A; and 11.63 g/cc for Sylvania's Th compacted at 75 tsi and sintered at 1550°C for 180 min in A. (auth)

9802 WAPD-T-46(Del.)

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

MECHANICAL PROPERTIES AND MICROSTRUCTURE OF ANNEALED ZIRCONIUM. W. L. Hudge, Jr. June 10, 1953. Decl. with deletions Feb. 28, 1956. 24p. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70(mf OTS).

The mechanical properties of unalloyed Zr are shown to vary markedly depending on the state of anneal of the metal. Hardness is used as an index of annealing condition. Precautions to be taken in obtaining reproducible hardness

values in zirconium are outlined. In addition, the appendix contains a hardness conversion table for zirconium base alloys. This covers the hardness range from approximately 60 to 250 DPH (20 to 100 R_B). (auth)

Refer also to abstract 9774.

PHYSICS

9803 AECU-3201
Sandia Corp., Albuquerque, N. Mex.
THE PROPAGATION OF SPHERICAL SHOCK WAVES. Erie E. Ungar. May 4, 1953. 68p. (TM-46-53-12). $10.80(ph OTS); $3.90(mf OTS).

R. Becker's article "Stosswelle and Detonation" (1921) is examined in detail with respect to the theory of shock waves. The Hugoniot relations are developed and are shown to be independent of friction and heat-transfer effects in the shock front. The theory of propagation of spherical shocks, as developed by Kirkwood and Brinkley (1947) is discussed. Comparison of theoretical and experimentally measured quantities is shown to demonstrate the validity of the theory. A glossary of hydrodynamical equations and a detailed annotated bibliography is also given. (auth)

9804 AECU-3232
Sandia Corp., Albuquerque, N. Mex.
PROBABILITY DISTRIBUTIONS OF TWO SINUSOIDS IN NOISE. D. M. Gragg and K. F. Tiede. Aug. 11, 1953. 39p. (TM-94-53-54). $7.80(ph OTS); $3.30(mf OTS).

Probability density functions and cumulative probability functions for the envelope of 2 sinusoidal signals with incommensurable frequencies and Rayleigh noise are given in tabular form and in curve form. (auth)

INSTRUMENTS

9805 AECU-3206
Sandia Corp., Albuquerque, N. Mex.
PRACTICAL METHODS FOR THE REDUCTION OF STRAIN GAGE DATA. Richard C. Dove. Sept. 7, 1955. 14p. (TM-188-55-16). $3.30(ph OTS); $2.40(mf OTS).

The error that results when it is attempted to evaluate stress from a reading taken on a single element SR-4 strain gage in a biaxial stress field is discussed. A method is presented for relating SR-4 rosette strain gage readings directly to the biaxial stress state without the necessity of first converting strain gage readings to true strains. Correction formulas are presented for use when single element SR-4 gages are used as rosette elements or as stress gages. (auth)

9806 AECU-3213
Sandia Corp., Albuquerque, N. Mex.
RAYPAC—A SPECIAL-PURPOSE ANALOG COMPUTER. H. B. Durham. Mar. 24, 1955. 12p. (TM-46-55-54). $3.30(ph OTS); $2.40(mf OTS).

As an aid in forecasting possible blast damage in areas distant from a bomb burst point, a special-purpose electronic analog computer has been developed. Sound ray paths (orthogonal trajectories to sound wave front) are computed as a function of meteorological conditions. (auth)

9807 AECU-3219
Brookhaven National Lab., Upton, N. Y.
COUNTING ROOM EQUIPMENT AND PROCEDURES AND SAMPLE PREPARATION. M. M. Weiss and J. S. Marshall. Revised May 1954; Appen. II, June 1, 1955. 74p. $12.30(ph OTS); $4.50(mf OTS).

Descriptions and procedures for some of the equipment used in the health physics counting rooms are given as supplements to the manuals issued by the manufacturers. Some units have been modified to fulfill special needs. These modifications are explained. (F.S.)

9808 CF-53-9-191
[Oak Ridge National Lab., Tenn.]
A THEORY OF CONTINUOUS CENTRIFUGATION. S. H. Jury. Sept. 30, 1953. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The design of conical disk centrifuges and interpretation of data therefrom has had its foundation in empiricism which leaves much to be desired. A theoretical solution to this problem has been found and tested, and it is the purpose of this memorandum to present it in detail. (auth)

9809 HW-35291
Hanford Atomic Products Operation, Richland, Wash.
AUTOMATIC IN-LINE MONITOR FOR pH, GAMMA ACTIVITY AND URANIUM IN THE METAL RECOVERY PLANT. W. H. Reas. Feb. 18, 1955. Decl. Feb. 20, 1956. 19p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Design details and data on the operating characteristics are presented for instruments developed for in-line monitoring of process streams. Included are a pH monitor, a continuous γ activity monitor, and an automatic photometer and an automatic polarograph for the determination of U concentrations. (C.H.)

9810 KAPL-M-SCT-6
Knolls Atomic Power Lab., Schenectady, N. Y.
MARK B, INERT GAS BUBBLER-TYPE LIQUID LEVEL INDICATOR PERFORMANCE TESTING WITH 99.99% NITROGEN. R. W. Wood. June 29, 1955. 31p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

Performance tests on an inert gas, bubbler-type liquid level indicator have been conducted utilizing dry N of 99.99% purity. Use of a similar type indicator for measuring Na level in hold tanks for SIR Mark B is planned. The indicator tested was subjected to immersion in molten or frozen Na for approximately 630 hours. A total of 430 cu. ft. of N were pressured through the indicator, of which 412 cu. ft. were bubbled through Na. The gas flow was maintained for about 335 hours. Test data indicate that partial plugging of the indicator was occurring after 320 hours of immersion in Na. At that time, about 165 hours of gas flow had been maintained. Plugging of the bubbler tube after approximately 600 hours of Na immersion was sufficient to render it ineffective as a level indicator. The bubbler tube tested was constructed from ½ in. Sch. 40 pipe. (auth)

9811 WAPD-RM-154
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
EXPONENTIAL CIRCUIT RESPONSE. William W. Ramage. [Dec. 7, 1951]. 35p. Contract AT-11-1-GEN-14. $0.30(OTS).

The nature of the response of a particular electronic circuit built to measure the exponential constant of a given signal is considered. The investigation includes both a theoretical and experimental analysis of the specified circuit. The important circuit parameters were determined, and their effect in conjunction with the effect of the magnitude of the initial signal and exponential constant upon the overall circuit response was determined. (auth)

ISOTOPES

9812 CF-55-11-104
Oak Ridge National Lab., Tenn.
LIMITING CONCENTRATIONS FOR FISSILE ISOTOPES.

J. T. Thomas. Nov. 17, 1955. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The limiting critical concentrations of aqueous solutions of the fissile isotopes are of particular interest to the chemical processing groups in the matter of nuclear safety. The purpose of this paper is to define the concentration regions wherein criticality is not possible. The method utilized defines safe concentrations with a rather wide but comforting margin. (auth)

9813 IDO-16274
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
PRODUCTION OF CARRIER-FREE COBALT-58 IN THE MTR. T. O. Passell. Apr. 4, 1955. 7p. Contract AT(10-1)-205. (PPC-126). $1.80(ph); $1.80(mf OTS).

The MTR VH-2 facility has been shown to be relatively efficient in producing Co^{58} by the $N^{58}(n,p)Co^{58}$ reaction. Assuming the number of neutrons effective in producing this reaction is the same as the measured number of thermal neutrons (1.8×10^{14} n/cm^2 sec) the cross section is 1.0 millibarns. On the basis of this measured "effective" cross section, it is proposed that Co^{58} be routinely produced in the MTR. (auth)

ISOTOPE SEPARATION

9814 AECD-3997
Oak Ridge National Lab., Y-12 Area, Tenn.
THE CYCLORATOR: A DEVICE FOR THE SEPARATION OF ISOTOPES BY TIME-OF-FLIGHT IN A MAGNETIC FIELD. R. S. Livingston, J. A. Martin, and R. L. Murray. Sept. 1951. Decl. with deletions Jan. 5, 1956. 45p. Contract W-7405-eng-26. $0.30(OTS).

When the time-of-flight principle is applied to isotope separation in a magnetic field, a separation-in-time is obtained which depends directly upon the difference in isotopic masses. Modulation of the ion beam is necessary for collection of separated isotopes. The relative merits of intensity, direction, and energy modulation are discussed. Separation of uranium isotopes, with low enrichment, was achieved by energy modulation. The cyclorator is found to have the same fundamental limitations as the calutron, the most significant being loss of resolution with increased throughput. (auth)

MATHEMATICS

9815 KAPL-M-LFE-14
Knolls Atomic Power Lab., Schenectady, N. Y.
IMPROVING THE CONVERGENCE OF SERIES: APPLICATION TO SOME ELLIPTIC INTEGRALS. Leo F. Epstein and Nancy E. French. Feb. 15, 1955. 16p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

MEASURING INSTRUMENTS AND TECHNIQUES

9816 AECD-4058
Monsanto Chemical Co., Dayton, Ohio.
LOW GEOMETRY ATTACHMENT FOR METHANE FLOW PROPORTIONAL ALPHA COUNTER. M. J. Rose. Oct. 7, 1947. Decl. Nov. 28, 1955. 18p. (Final Report No. 47). $0.20(OTS).

A low-geometry attachment was developed for counting high values of α activity with a Simpson Methane Flow Proportional Alpha counter. The counting rate of the combined counter and attachment is 2×10^5 to 2×10^9 disintegrations/min with an accuracy of ±2%. By mechanically sliding the base plate from one position to another, two geometries are obtained. An extension to the plug obtains a third geometry. (F.S.)

9817 HW-38636
[Hanford Atomic Products Operation, Richland, Wash.]
DESIGN NOTES AND COMPONENT RECOMMENDATIONS FOR GAMMA-SCINTILLATION MONITORING SYSTEMS. R. E. Connally. Sept. 2, 1955. 7p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

NEUTRONS

9818 AECU-3204
Sandia Corp., Albuquerque, N. Mex.
A COMPARISON OF THE NEUTRON YIELDS FROM LOW-VOLTAGE SOURCES. John N. Cooper. Oct. 6, 1954. 12p. (TM-225-54-51). $3.30(ph OTS); $2.40 (mf OTS).

The ratio of the thick-target neutron yields from the $D(t,n)He^4$ and the $D(d,n)He^3$ reactions is calculated as a function of the energy of the bombarding particles. For 60-kev particles the ratio is 108. It increases to 168 at 100 kev and to 194 for 120-kev particles. A qualitative discussion of the yields from various deuterium targets leads to the conclusion that the greatest yield would come from the target which has the lowest stopping cross section per deuterium atom. (auth)

9819 CF-53-3-36
Oak Ridge National Lab., Tenn.
THE SLOW-NEUTRON FLUX IN THE VICINITY OF A STRONGLY-ABSORBING, FINE WIRE. C. H. Barkelew. Mar. 3, 1953. 8p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80(mf OTS).

A method is described which may be used to estimate the slow-neutron flux in the vicinity of an absorber which is extremely small compared to the mean free path for the diffusion of neutrons. The particular case of a strongly absorbing fine wire is considered in detail. (B.J.H.)

9820 HW-27986
[Hanford Atomic Products Operation, Richland, Wash.]
NEUTRON DIFFUSION AND RANDOM WALK. [PART] II. G. E. Duvall. May 7, 1953. 9p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The random walk theory of neutron paths through a moderator is developed, and equations for the slowing down of neutrons are given. (B.J.H.)

9821 KAPL-M-PFZ-1
Knolls Atomic Power Lab., Schenectady, N. Y.
CALCULATION OF NEUTRON AGES AND FLUX DISTRIBUTIONS IN WATER FROM A D-D SOURCE. Preliminary Report. Paul F. Zweifel. Mar. 28, 1955. 15p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

In an attempt to locate the source of the discrepancy between calculated and measured neutron flux distributions and ages in water, an experiment utilizing a D-D neutron source was conducted at the National Bureau of Standards. The advantage of this experiment is that the source-energy spectrum can be predicted theoretically, which is not possible for a fission source. A discussion of the theory of the calculations is given, and preliminary numerical results are reported. (auth)

NUCLEAR PHYSICS

9822 CF-55-8-58
Oak Ridge National Lab., Tenn.
RADIATION CURRENT ON THE AXIS OF A CIRCULAR DISC SOURCE. N. F. Lansing and E. P. Blizard. Aug.

11, 1955. 3p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

NUCLEAR PROPERTIES

9823 CF-55-5-126
Oak Ridge National Lab., Tenn.
DIRECT POLARIZATION OF In^{115} NUCLEI: J VALUE FOR 1.456 eV RESONANCE. J. W. T. Dabbs, L. D. Roberts, and S. Bernstein. [June 1955]. 132p. Contract W-7405-eng-26. $0.65(OTS).

Methods of producing and observing polarization in nuclei were reviewed, and a detailed study of the "brute force" method was made. Experiments were designed and conducted, using In^{115} nuclei, which demonstrated the applicability of this method. (D.E.B.)

9824 LA-1250
Los Alamos Scientific Lab., N. Mex.
THE AVERAGE FISSION CROSS SECTION OF U^{233}, U^{234}, AND U^{236} IN THE FAST REACTOR NEUTRON SPECTRUM. E. Jurney. May 18, 1951. Decl. Apr. 4, 1956. 5p. Contract [W-7405-eng-36]. $0.15(OTS).

The results of fission cross section measurements in the high energy neutron spectrum of the fast reactor at Los Alamos are given for U^{233}, U^{234}, and U^{236}. (F.S.)

9825 LA-1853
Los Alamos Scientific Lab., N. Mex.
TOTAL NEUTRON CROSS SECTION OF He^3. Lawrence Cranberg, R. L. Mills, T. R. Roberts, R. B. Beyster, Robert B. Day, Richard L. Henkel, Ralph A. Nobles, R. K. Smith, S. G. Sydoriak, R. G. Taylor, and M. Walt. Oct. 15, 1954. Decl. Feb. 1, 1956. 17p. Contract W-7405-eng-36. $0.20(OTS).

The total neutron cross section of He^3 has been measured over the energy range from 200 kev to 22 Mev in good geometry. The main feature of the curve is a maximum at 2 Mev, superimposed on a decrease in cross section that is otherwise monotonic with increase in energy. Where the known $He^3(n,p)T$ cross section overlaps these measurements, it comprises about one-third of the total cross section and has a similar variation with energy. The total elastic scattering cross section is obtained from the difference between the total cross section and the (n,p) cross section for neutron energies from 600 kev to 4 Mev. (auth)

NUCLEAR REACTORS

9826 AECD-3976
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
MATERIALS TESTING REACTOR—STRUCTURE TEMPERATURES. G. H. Hanson, K. A. McCollom, and A. V. Grimaud. Feb. 13, 1953. Decl. with deletions Nov. 30, 1955. 103p. Contract AT(10-1)-205. $0.55(OTS).

At 30 megawatts, the design power level of the MTR, no reactor structure temperatures were observed which exceeded the maximum permissible levels for the various components of the reactor. The highest temperature observed in the graphite-ball zone was 216°F which is definitely below 300°F, the limiting operating temperature for a significant volume of graphite. The maximum variation of the observed thermal-shield temperatures was 22°F. The maximum design variation within a given section of the thermal shield was 33°F, and the resulting calculated thermal stresses were considered acceptable. The highest operating temperature in the concrete biological shield was 109°F, which was less than 35°F above the temperature of the reactor room. From thermal-stress considerations the maximum acceptable temperature difference with a concrete structure is approximately 50°F. A master set of reactor structure temperatures for a 3 × 9 lattice operating at full power with an average set of operating conditions has been developed, and a detailed analysis of the temperature distributions within the various components of the reactor is reported. A qualitative evaluation of the effect of operating conditions on the structure temperatures has also been made. (auth)

9827 AECD-3979
Oak Ridge National Lab., Tenn.
THE EFFECT OF GAPS ON PILE REACTIVITY. S. Tamor. July 14, 1952. Decl. with deletions Dec. 1, 1955. 18p. Contract W-7405-eng-26. $0.20(OTS).

The variation of the reactivity of a pile as a function of width of a transverse gap is obtained. The method involves first finding the boundary condition satisfied by the flux at the gap face. This, in principle, provides enough information for a complete solution of the pile equations. A method for calculating the reactivity change is presented. The calculated reactivity is compared with experiment and a brief discussion of the validity of the approximations is given. (auth)

9828 AECD-4158
[Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.].
ADVANCED SEMINAR IN REACTOR PHYSICS. Nicholas M. Smith, Jr. July 26, 1950. Decl. Jan. 16, 1956. 16p. Contract [W-7405-eng-26]. (Y-F10-7). $3.30(ph OTS); $2.40(mf OTS).

Notes on the numerical solution of multi-group age equations are given. (B.J.H.)

9829 AECD-4215
Brookhaven National Lab., Upton, N. Y.
PROPERTIES OF URANIUM—BISMUTH REACTORS FOR COMPUTER PROGRAMS. B. Mozer. Jan. 4, 1955. Decl. Feb. 8, 1956. 13p. $3.30(ph OTS); $2.40(mf OTS).

A survey is reported of the properties of the U—Bi fluid fuel reactors of U^{235} and U^{233} as a fuel using a large graphite density. This survey includes properties of the core and various reflectors which will be useful for large machine calculations of reflector savings, fast and thermal fluxes, and quantities of interest based on two group calculations. (F.S.)

9830 AECD-4217
Knolls Atomic Power Lab., Schenectady, N. Y.
THE EFFECTS OF INTERNAL CONVERSION ON CRITICAL MASS AND OPERATING LIFE OF A THERMAL REACTOR. T. M. Snyder. July 21, 1952. Decl. Feb. 9, 1956. 6p. Contract W-31-109-Eng-52. (MEMO-TMS-7). $1.80(ph OTS); $1.80(mf OTS).

Rough predictions of the expected effects of internal conversion on the critical mass and reloading period of a bare thermal reactor are made and the simultaneous relationship between reactor life and fuel inventory is given. (F.S.)

9831 AECD-4219
Knolls Atomic Power Lab., Schenectady, N. Y.
MULTIGROUP ANALYSIS ON THE IBM 604. R. H. Stark, C. Hibbert, and D. Z. Ryan. Apr. 7, 1953. Decl. Feb. 9, 1956. 18p. Contract W-31-109-Eng-52. (MEMO-RS-1). $3.30(ph OTS); $2.40(mf OTS).

Included are complete equations for the 604 multigroup calculation, description of the machine layout, procedures for running the calculation, and plugboard diagrams. (B.J.H.)

9832 BNL-2742
Brookhaven National Lab., Upton, N. Y.
EFFECTS OF URANIUM BUILDUP IN THE LMFR BREEDING BLANKET. B. Mozer. Mar. 15, 1955. Decl. Feb. 8, 1956. 14p. Contract AT(30-2)-gen-16. $3.30 (ph OTS); $2.40(mf OTS).

The effects of U buildup in the blanket have been calculated for a spherical two-region liquid metal fuel reactor in which the flux distribution is given by the simple two-group approximation. The results indicate a small decrease in the critical size of the reactor, a constant breeding gain, and an increase in the fast leakage as a result of increasing the concentration of uranium in the blanket. The calculations show that a concentration of 200 ppm of U to Bi in the blanket is not excessive. (auth)

9833 CE-1391
[Chicago. Univ.] Metallurgical Lab.
CUSHIONING MATERIALS FOR DISCHARGING SLUGS. S. G. Bankoff. Feb. 29, 1944. Decl. Feb. 14, 1956. 8p. (A-2032). $1.80(ph OTS); $1.80(mf OTS).

Studies were made of materials to line the Hanford discharge chutes in order to prevent damage to the slug jackets during unloading of the pile. Rubber and neoprene combinations, in particular, were impact and radiation tested. These samples became appreciably harder under β irradiation, so that any delay of the slug on the chute surface cannot be tolerated. Results of impact tests were good. (B.J.H.)

9834 CF-3562
Argonne National Lab., Lemont, Ill.
THE DIFFUSION LENGTH IN THE BERYLLIUM OXIDE PILE. D. J. Hughes, W. D. B. Spatz, C. Eggler, N. Goldstein, E. Goldfarb, H. Murdock, and J. Wallace. July 10, 1946. Decl. Feb. 16, 1956. 16p. Contract W-31-109-eng-38. $3.30(ph OTS); $2.40(mf OTS).

The diffusion length, L, in the BeO–U lattice was measured, using a method of simulating the thermal neutron absorption of U by boron. The measured value of L for the boron concentration used (about equivalent to a 0.025 UO_2/BeO concentration) is 8.0 cm compared to an expected 5 cm. The discrepancy is partly explained by self-protection in the fuel sticks which was not allowed for in the calculations. However, the remaining discrepancy indicates either a smaller O_{tr} of BeO than assumed in the calculation or some inadequacy in the calculation itself. (auth)

9835 CF-47-11-13
Oak Ridge National Lab., Tenn.
FACILITIES FOR INVESTIGATION OF POWER PILE MATERIALS IN THE HIGH FLUX PILE. J. R. Dietrich. Oct. 27, 1947. Decl. Dec. 15, 1955. 32p. Contract [W-7405-eng-26]. (M-4178). $0.30(OTS).

An estimation was made of the external facilities which will be required in the high-flux reactor for research on materials for power producing reactors and components. Only facilities existing within the outer boundary of the shield were considered. (F.S.)

9836 CF-49-11-152
Oak Ridge National Lab., Tenn.
PRESSURE SHELL AND CLOSURE DESIGN FOR THE HOMOGENEOUS REACTOR. C. L. Segaser. Nov. 15, 1949. Decl. Feb. 14, 1956. 9p. $1.80(ph OTS); $1.80 (mf OTS).

The proposed design for a pressure shell based on a spherical internal shell of 19½-in. radius is analyzed for stresses, closures, and flange stress and leak detection. (F.S.)

9837 CF-50-7-173
[Oak Ridge National Lab., Tenn.]
HRE HEAT BALANCE. Robert Von Berg. July 26, 1950. Decl. Feb. 7, 1956. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations were made to determine the heat losses of the HRE. Complete heat balances were also made so that over-all thermal efficiency of the reactor as an electric power producer could be determined. Results of the work are tabulated. (B.J.H.)

9838 CF-50-12-86
Oak Ridge National Lab., Tenn.
SHIELDING REQUIREMENTS FOR THE PULSAFEEDER SOUP PUMP. C. L. Segaser. Dec. 20, 1950. Decl. Feb. 7, 1956. 8p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Since the soup in the entire pump system will ultimately become saturated with fission products, all parts of the system containing soup must be adequately shielded. Calculations were thus made to determine the thickness of concrete required to cover the pit in which the pump is located in order to reduce radiations from the soup to biological tolerance at the operating floor. It is concluded that a total thickness of iron-aggregate concrete shielding of not less than 3 ft should be used to cover the pit. (B.J.H.)

9839 CF-51-1-6
[Oak Ridge National Lab., Tenn.]
EFFECT OF FAST NEUTRON ABSORPTION BY $_8O^{16}$ IN THE BOILER WATER ON THE INDUCED ACTIVITY OF STEAM IN THE POWER CIRCUIT OF THE HRE AT 1000 KW POWER LEVEL. Charles L. Segaser. Jan. 3, 1951. Decl. Feb. 7, 1956. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An estimate is made of the radiation from the N^{16} produced by the reaction of O^{16} in the boiler water with fast neutrons. It is concluded that the radiation thus formed and carried over from the steam to the turbine is negligible. (B.J.H.)

9840 CF-51-5-12
[Oak Ridge National Lab., Tenn.]
CALCULATIONS ON THE EMERGENCY COOLING SYSTEM. R. H. Chapman. May 1, 1951. Decl. Feb. 7, 1956. 18p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The operating characteristics of the natural convection cooling system of the HRE, with the D_2O tanks acting as a condenser for the D_2O evaporator and with the cooling system used to dissipate heat after a shutdown, are determined. (F.S.)

9841 CF-51-6-42
[Oak Ridge National Lab., Tenn.]
THERMAL SHIELD AND PRESSURE SHELL DESIGN FOR 15 FT. HOMOGENEOUS REACTOR TANK AT 50 KW PER LITER SPECIFIC POWER. C. L. Segaser. June 12, 1951. Decl. Feb. 7, 1956. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The principal loadings producing stress in the pressure shell and thermal shielding of large homogeneous spherical reactor tanks are due to the internal pressure of the fluid contained and the temperature differentials induced in the shell walls by absorption of leakage radiation from the reactor core. The tangential thermal stress induced by these temperature differentials becomes so large at high reactor power levels that operation may be limited to some lower power unless means are provided to reduce these stresses to tolerable values. A 15-ft diameter single shell homogeneous spherical reactor is apparently limited

to a power level not exceeding 2.5 kw per liter if the total stress in the pressure shell is not allowed to exceed 15,000 psi as recommended by the 1950 ASME Boiler Code for Unfired Pressure Vessels. The optimum thickness of shell required for such a single shell reactor to contain fluid at 1000 psi pressure is 6 inches at 2.5 kw per liter. Two methods are known for reducing the magnitude of thermal stress. The thickness of the shell may be decreased, and/or the shell may be cooled simultaneously on both sides to the same temperature. Either method results in a smaller temperature differential in the wall, and, hence, a lesser thermal stress. It is shown that a reduction of shell thickness decreases the thermal stress, but the total stress from the combined loading still greatly exceeds the assumed maximum allowable stress of 15,000 psi. To be economically feasible, Lane and Briggs have shown that a homogeneous reactor must operate in the order of magnitude of 1,000,000 kw. At this total power, a 15-ft diameter reactor must operate at a power density of 20 kw per liter. At 20 kw per liter, the optimum pressure shell thickness is approximately 2 inches, but the total minimum tangential shell stress exceeds 40,000 psi. In order to operate at a power density of 50 kw per liter, the amount of leakage radiation from the reactor core absorbed by the pressure shell must be reduced to where the total combined stress from pressure and temperature will not exceed the upper allowable design stress for the pressure shell material. It is shown in this report that a total of 6 inches of iron thermal shielding, is required. With 6 inches of shielding material and cooling space, the inner radius of the necessary pressure shell is 100 inches, which to contain the fluid at 1000 psi pressure, requires a $4\frac{1}{2}$ inch thick steel wall. The maximum stress in the welded joints will, therefore, be not greater than 13,750 psi which will meet the ASME Boiler Code requirement for a welded vessel at joint efficiencies of 90%. (auth)

9842 CF-51-8-31
Oak Ridge National Lab., Tenn.
PRESSURIZER DESIGN. T. A. Welton. Aug. 6, 1951. Decl. Feb. 7, 1956. 6p. Contract W-7405-eng-26. $1.80 (ph OTS); $1.80(mf OTS).

A pressurizer was designed for the HRE which appears to be safe. The oscillation frequency is sufficiently higher which makes the behavior for large fuel surges considerably more favorable. The sole disadvantage is a small increase in soup volume and a consequent increase of 50 grams in the critical mass. (F.S.)

9843 CF-51-8-216
Oak Ridge National Lab., Tenn.
ORNL RESEARCH REACTOR DESIGN DATA. W. E. Sholl, Jr. Aug. 30, 1951. Decl. Dec. 22, 1955. 33p. Contract [W-7405-eng-26]. $0.25(OTS).

The research reactor is a light-water moderated heterogeneous thermal reactor with a beryllium reflector similar to, but much less complex than, the Arco MTR. The aim in design of the research reactor is to provide a number of versatile experimental facilities with high flux access and do this at a minimum cost. A design is herein specified which is believed to fulfill this requirement through standardization of experimental facilities, extensive simplication of the MTR unit arrangement, and a design power level compatible with low external service facility costs and high available flux levels. (auth)

9844 CF-51-9-70
Oak Ridge National Lab., Tenn.
HRE HEAT LOSSES DURING NORMAL OPERATION. Leon Cooper. Sept. 7, 1951. Decl. Feb. 7, 1956. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations have been performed to determine the heat losses from the piping and certain of the components of the HRE when it is in normal operation. Heat losses during shutdown or dumping have not been considered. A discussion of the method used and a sample calculation is given for the case of heat loss from the pipe lines. The results of all such calculations are summarized in tabular form. (auth)

9845 CF-51-10-107
Oak Ridge National Lab., Tenn.
DAMPING COEFFICIENTS IN THE DUMP LINE TO THE REACTOR VESSEL. R. E. Aven. Oct. 16, 1951. Decl. Feb. 9, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations of the damping coefficients in the dump line are given. (B.J.H.)

9846 CF-51-11-130
Oak Ridge National Lab., Tenn.
BOILING REACTORS. VARIATION OF REACTOR STABILITY WITH OPERATING POWER LEVEL AND AVERAGE BUBBLE SIZE. P. R. Kasten. Nov. 23, 1951. Decl. Feb. 7, 1956. 9p. Contract W-7405-eng-26. $1.80 (ph OTS); $1.80(mf OTS).

The effect of average bubble size and operating power level upon reactor stability was studied. Boiling reactor stability increases with the power level and with a decrease in bubble size. The operating pressure should be high to improve the power density attainable and yet have sufficient bubble nuclei for good stability. Bubble delay times of the order of 0.01 second appear feasible if many small gas bubbles are formed throughout the reactor due to liquid decomposition. (F.S.)

9847 CF-51-12-73
Oak Ridge National Lab., Tenn.
SHIELDING CALCULATIONS FOR THE MTR CHARGER AND CARRIER. H. O. Weeren. Dec. 13, 1951. Decl. Feb. 20, 1956. 12p. Contract W-7405-eng-26. $3.30 (ph OTS); $2.40(mf OTS).

The MTR carrier and charger hold MTR assemblies in baskets which are fitted into square shaped receptacles inside the units and lead plugs of circular cross section rest above the receptacles. Calculations were made to determine the amount of radiation which would come through any gap between the plug and its seat. The results are discussed, and it is recommended that a slab of lead of triangular cross section be placed in each corner of the carrier. (B.J.H.)

9848 CF-52-1-180
[Oak Ridge National Lab., Tenn.]
THE EFFECTS OF SCALE-UP ON THE HYDRODYNAMICS OF REACTORS. L. Cooper. Jan. 25, 1952. Decl. Feb. 7, 1956. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The small amount of quasi-theoretical and experimental data obtained from a study of a 1.5-ft-diameter plastic sphere were used in the problem of scale-up on the hydrodynamics of spherical reactors and some considerations of cylindrical reactors. Principle considerations were given to the effects of flow patterns, pressure drops, and gas residence times in scaling up to an 8 and 15 ft diameter sphere. (F.S.)

9849 CF-52-10-38
Oak Ridge National Lab., Tenn.
PRESSURE DROP AND GAS RESIDENCE TIME FOR A FOUR FOOT CORE. Leon Cooper. Oct. 4, 1952. Decl. Dec. 8, 1955. 3p. Contract [W-7405-eng-26]. $0.10(OTS).

9850 CF-52-12-70
Oak Ridge National Lab., Tenn.
TEAPOT RECOMBINER. J. R. McWherter. Dec. 9, 1952.

Decl. Feb. 7, 1956. 3p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

9851 CF-53-1-140
Oak Ridge National Lab., Tenn.
OPERATION OF BOILING REACTORS. PART I. POWER DEMAND RESPONSE. P. R. Kasten. Jan. 14, 1953. Decl. Jan. 10, 1956. 20p. Contract [W-7405-eng-26]. $0.20(OTS).

The characteristics of a boiling system operating as a power demand machine have been investigated. In general, with no system control of any kind, boiling reactors have poor power demand response. No difficulty should be encountered with the addition of a system control, which may be required from other considerations. (auth)

9852 CF-53-1-230
Oak Ridge National Lab., Tenn.
BOILING REACTOR SHIELD DESIGN STUDY. J. R. McWherter. Jan. 9, 1953. Decl. Feb. 8, 1956. 16p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Preliminary drawings of a building and shield for boiling reactor experiments were completed. The underground shield has a removable cover, is 35 ft square and 30 ft deep with 6 cells separated by 3 ft concrete walls. A 10-ft wide operating gallery permits unshielded equipment during operation. (F.S.)

9853 CF-53-1-253
Oak Ridge National Lab., Tenn.
REACTIVITY CHANGES CAUSED BY COMPRESSION OF AN MTR TYPE LATTICE. L. C. Noderer. Jan. 22, 1953. Decl. Feb. 8, 1956. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

When a water-reflected MTR type lattice is compressed so that water leaves the core there are opposing effects upon the reactivity. Increases in the age and geometrical buckling tend to decrease the reactivity more than the increase in thermal utilization and decrease in thermal diffusion length tend to increase the reactivity. This is the result of the high fast leakage characteristic of this type of reactor and the fact that the water to U ratio in the core is low enough so that the water acts more efficiently as a moderator than it does as a poison. For the proposed tower reactor $\partial k_{eff}/\partial z = k_{eff}(0.0048)$. (auth)

9854 CF-53-9-1
Oak Ridge National Lab., Tenn.
THEORY OF THE FAST U^{238} CONVERTER. L. Dresner. Sept. 1, 1953. Decl. Feb. 8, 1956. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

9855 CF-53-9-169
Oak Ridge National Lab., Tenn.
ISHR HIGH PRESSURE CONDENSER DESIGN. R. E. Aven. Sept. 22, 1953. Decl. Dec. 1, 1955. 29p. Contract [W-7405-eng-26]. $0.25(OTS).

The ISHR high pressure gas condenser is designed to remove the sensible heat above 250°C and to condense part of the D_2O present in the gas mixture coming from the recombiner. Calculations of required heat transfer and condensing surface areas are included. The recommended design is a horizontal condenser with 100 1-in. BWG 13 tubes of such a length that 9 ft 11 in. of each tube is exposed as cooling surface. The condenser design will have water boiling outside the tubes at 200 psi as a coolant. (B.J.H.)

9856 CF-53-11-62
Oak Ridge National Lab., Tenn.
H.R.E. HEAT EXCHANGER BEHAVIOR. H. F. Poppendiek. Nov. 9, 1953. Decl. Feb. 8, 1956. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Notes are summarized on the effects of bypasses, tube plugging, and tube deposits on the heat transfer and pressure drop characteristics of the HRE heat exchangers. (B.J.H.)

9857 CF-54-1-80
Oak Ridge National Lab., Tenn.
ALTERNATE CORE PROPOSAL FOR THE HRT. L. B. Lesem and I. Spiewak. Jan. 28, 1954. Decl. Feb. 9, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Test results indicate that a core with concentric inlet and outlet pipes at the north pole would be suitable for the HRT. (B.J.H.)

9858 CF-54-2-72
Oak Ridge National Lab., Tenn.
CALCULATIONS FOR HRT MAIN HEAT EXCHANGER. (Supplement to CF-53-12-94.) C. L. Segaser. Feb. 2, 1954. Decl. Nov. 29, 1955. 9p. Contract [W-7405-eng-26]. $0.15(OTS).

Calculations are given for a 5000-kw vaporizing heat exchanger for HRT, based on a fuel solution of 10 g/l of UO_2SO_4 in D_2O. (F.S.)

9859 CF-54-2-165
Oak Ridge National Lab., Tenn.
CRITICAL CONCENTRATION OF U-235 IN CORE OF HRT. R. B. Briggs. Feb. 23, 1954. Decl. Feb. 8, 1956. 3p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80 (mf OTS).

Data are summarized which show the effect of blanket thickness and composition on the critical concentration of U^{235} in the HRT core. (B.J.H.)

9860 CF-54-3-57
Oak Ridge National Lab., Tenn.
HEAT TRANSFER AND PRESSURE LOSS IN PROPOSED ORR FUEL ASSEMBLIES. J. P. Sanders. Mar. 11, 1954. Dec. Dec. 16, 1955. 36p. Contract [W-7405-eng-26]. $0.30(OTS).

Pressure losses in the cooling system were related to the flow rate in the ORNL Research Reactor and an expression was developed and evaluated to give the maximum temperature of the surface in contact with the water as a function of flow rate, inlet water temperature, and maximum heat flux. Inlet and exit flow areas should be rectangular in cross section to increase flow areas and eliminate sudden change from circular to rectangular cross section. (F.S.)

9861 CF-54-3-126
Oak Ridge National Lab., Tenn.
OPTIMIZATION TECHNIQUES APPLIED TO REACTOR CALCULATIONS. H. F. McDuffie. Mar. 25, 1954. Decl. Feb. 20, 1956. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The application of some techniques used in industrial experimentation to optimization problems in reactor calculations is briefly discussed. Results of a cost analysis are included. (B.J.H.)

9862 CF-54-3-169
Oak Ridge National Lab., Tenn.
OPERATING CONDITIONS OF THE ORR COOLING SYSTEM. J. P. Sanders. Mar. 19, 1954. Decl. Feb. 20, 1956. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Calculations are reported for determining the minimum water-velocities, the inlet water temperature and the design conditions for operating the ORNL Research Reactor at 5, 10, and 30 megawatts. (F.S.)

9863 CF-54-4-30
Oak Ridge National Lab., Tenn.
FUEL DUMP TANKS FOR HRT. Sidney Visner. Apr. 2,

1954. Decl. Dec. 7, 1955. 12p. Contract [W-7405-eng-26]. $0.15(OTS).

Certain dimensions and geometries have been recommended for the HRT dump tanks. These specifications were based on considerations of criticality, operating time and temperature, and blanket concentration. (C.W.H.)

9864 CF-54-4-171
Oak Ridge National Lab., Tenn.
AN ESTIMATE OF THE CONTRIBUTION TO THE RADIATION INTENSITY ABOVE THE SURFACE OF THE RESEARCH REACTOR DUE TO THE PRESENCE OF NITROGEN^{16}. F. T. Binford. Apr. 27, 1954. Decl. Feb. 20, 1956. 17p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

For purposes of estimation the reactor is idealized to consist of two coaxial cylinders and a sphere. It is assumed that N^{16} atoms are produced only by the action of the uncollided flux above the $O^{16}(n,p)N^{16}$ threshold of 12.2 Mev, that the energy spectrum of neutrons leaking from the core is essentially the same as the fission spectrum, and that the dimensions of the outer cylinder are large compared to the mean free path of the uncollided neutrons. Complete developments of equations for the activity are included. It is found that the radiation intensity a foot above the pool surface and lying on its extended axis is $4.56\ P \times 10^{-3}$ r/hr where P is the power level in megawatts. (B.J.H.)

9865 CF-54-4-228
Oak Ridge National Lab., Tenn.
MECHANICAL PRESSURIZER AS AN HRT SAFETY DEVICE. Paul R. Kasten. Apr. 22, 1954. Decl. Feb. 9, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The possibility of substituting a mechanical valve for the steam pressurizer arrangement in the HRT was studied from the safety standpoint. Two types of valves were studied, one which starts to open whenever a set core overpressure is exceeded while the other is a spring-loaded solenoid type. For the conditions studied, either type of valve appears to be satisfactory with respect to resulting core overpressures. (B.J.H.)

9866 CF-54-5-164
Oak Ridge National Lab., Tenn.
NEUTRON FLUX AND STAINLESS STEEL ACTIVATION IN HRT CELLS WITH BARYTES CONCRETE WALLS. Phillip M. Wood. May 19, 1954. Decl. Feb. 9, 1956. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An estimate of the neutron flux distribution in the HRT cell is shown for D_2O, UO_2SO_4, and ThO_2–D_2O reactor blankets, respectively. The cell considered in this estimate is assumed to have barytes concrete walls with no shielding wall immediately around the reactor. The modification of these results to fit the barytes sand and water shield contained in steel tanks is discussed at the end of this report. To simplify the calculation, the reactor cell was assumed to be a 24-ft diameter spherical cavity with infinite barytes concrete walls. The reactor operating at 5 MW core power at 280°C is assumed to be located at the center of the cavity. (auth)

9867 CF-54-5-197
Oak Ridge National Lab., Tenn.
EFFECT OF USING ORDINARY WATER IN THE HRT WITH 500 gm/lt (At 280°C) ThO_2 SLURRY BLANKET. P. M. Wood. May 24, 1954. Decl. Feb. 8, 1956. 2p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Results are given of preliminary calculations to determine the relative merits of ordinary water and D_2O in the HRT. (B.J.H.)

9868 CF-54-6-74
Oak Ridge National Lab., Tenn.
SELECTION OF FLANGE DESIGN FOR HIGH PRESSURE SERVICE IN THE HRT. W. R. Gall. June 9, 1954. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Results are given of an analysis made to establish a basis for selection of the best type of flanges for use in the HRT high pressure systems. On the basis of this analysis the use of a 1500-lb ring joint weld neck design was recommended for use. (B.J.H.)

9869 CF-54-6-78
Oak Ridge National Lab., Tenn.
HRT COOLER DESIGN DATA. R. G. Pitkin. June 10, 1954. Decl. Dec. 8, 1955. 6p. Contract W-7405-eng-26. $0.15(OTS).

Designs have been worked out for dump and feed coolers for the HRT core and blanket. The dump cooler design consists of a U shaped shell containing a bundle of stainless steel tubes. The tube bundle carries many segmented baffles closely spaced to provide adequate turbulence in the cooling water stream. The feed coolers have been designed on the basis of a jacketed tube and may be identical for core and blanket. Design data for the coolers are presented. (M.P.G.)

9870 CF-54-6-184
Oak Ridge National Lab., Tenn.
HEAT GENERATION IN THE BLANKET REGION OF THE HRT WITH D_2O REFLECTOR AND ThO_2 SLURRY BLANKET, AND BUILDUP OF U-233 IN THE ThO_2 BLANKET. Phillip M. Wood. June 15, 1954. Decl. Feb. 9, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations of the heat generation and U^{233} buildup are summarized, and complete results are given in graphical form. (B.J.H.)

9871 CF-54-7-64
Oak Ridge National Lab., Tenn.
BOUNDARY VALUES FOR THE INNER RADIUS OF A CYLINDRICAL ANNULUS REACTOR. July 10, 1954. E. L. Zimmerman. July 10, 1954. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A boundary condition applicable to the inner radius of cylindrical annular reactors of finite length is derived. The method assumes the validity of diffusion theory and also that the flux is separable into radial and axial parts. The result gives the ratio of the flux to the radial derivative of the flux as a function of the mean free path of neutrons in the multiplying material, the ratio of length to radius of the inside cylinder, and length of the inside cylinder. (auth)

9872 CF-54-7-122
Oak Ridge National Lab., Tenn.
HRT ENTRAINMENT SEPARATOR DESIGN STUDY. C. L. Segaser. July 23, 1954. Decl. Dec. 2, 1955. 21p. Contract [W-7405-eng-26]. $0.25(OTS).

Entrainment separators have been studied as a possible means of removing moisture and/or solids from the HRT gas-vapor mixture entering the recombiner from the dump tanks. It is concluded that a wire-mesh type is the logical choice as a primary entrainment separator. Design information is summarized, and the suggested entrainment separator layout for the HRT is shown. (M.P.G.)

9873 CF-55-1-3
Oak Ridge National Lab., Tenn.
A FURTHER STUDY OF PRESSURE RISE IN HRT SHIELD. Phillip M. Wood. Jan. 3, 1955. Decl. Feb. 9, 1956. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Assuming simultaneous failure of the HRT pressure

vessel and one heat exchanger, an upper limit of the pressure rise in the equipment cell is calculated. (D.E.B.)

9874 CF-55-2-74
Oak Ridge National Lab., Tenn.
COMMENTS ON THE PHYSICS OF THE HRT, WITH SPECIAL REFERENCE TO REACTOR KINETICS. G. T. Trammell and T. A. Welton. Feb. 15, 1955. Decl. Feb. 9, 1956. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

9875 CF-55-5-166
Oak Ridge National Lab., Tenn.
HOLDING FORCE REQUIRED FOR HRT PRESSURE VESSEL. Paul R. Kasten. May 25, 1955. Decl. Feb. 20, 1956. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A study has been made of the reaction force arising from breaking the inlet fluid flange nozzle of the pressure vessel, the initial pressure and temperature being 2000 psi and 300°C. Based upon reasonable assumptions, the maximum upward distance the pressure vessel could travel would be ~4 feet if no holding force were present. With a 10,000-lb additional weight, the maximum distance would be ~$2\frac{1}{2}$ feet and with a 20,000-lb additional weight the maximum distance would be ~1.6 feet. To ensure zero upward movement a holding force of 50,000 lbs would be required. (auth)

9876 CF-55-9-172
Oak Ridge National Lab., Tenn.
A PARAMETRIC STUDY OF RATE OF POWER REMOVAL FROM HOMOGENEOUS BOILING REACTORS. L. G. Alexander and S. Jaye. Sept. 20, 1955. 14p. Contract W-7405-eng-26. $0.20(OTS).

Power density for stable operation was calculated for a simple reactor model at pressures in the range from 500 to 2500 psi, reactor heights from 10 to 20 ft., mean density decreases from 0.2 to 0.5, and flow resistance "velocity-heads" from 3.0 to 9.0. At 2000 psi, height of 15 ft., mean density decrease of 0.4, head loss of 4.5, the power density predicted was 18.5 kw/liter for the case where the fission rate is uniform throughout the core. By suppressing fissions in the downcomer, this power density can be approximately doubled. (auth)

9877 CF-55-10-45
Oak Ridge National Lab., Tenn.
PRESSURE RISE IN TBR FOLLOWING RAPID ADDITION OF REACTIVITY. M. W. Rosenthal. Oct. 14, 1955. Decl. Feb. 20, 1956. 25p. Contract [W-7405-eng-26]. $0.25 (OTS).

In order to provide information for evaluation of hazards associated with operation of the TBR, the peak pressure rise which would occur in the reactor core during a power excursion has been related to rate of reactivity addition and equivalent instantaneous reactivity addition. The reactivity increase engendered by a rapid reduction in heat-exchanger steam pressure has been obtained as a function of rate of change in boiling temperature. From these results, the magnitude of the core pressure surge that would follow a specified decrease in steam pressure can be estimated. (auth)

9878 CP-715
Chicago. Univ. Metallurgical Lab.
THE CONTAMINATION OF COOLING WATER BY A P-9 PLANT. F. L. Friedman. June 1, 1943. Decl. Feb. 14, 1956. 11p. (A-901). $3.30(ph OTS); $2.40 (mf OTS).

The following sources of contamination in cooling water of the P-9 plant are considered: fission recoils; corrosion of metal; recoil from aluminum; and induced activity in the water. It is found that for a P-9 plant of 3.5×10^4 kw contamination of the river at "X" should not exceed the 0.1 r criterion unless coating failure occurs. Tables of the amount of coating failure permissible are given as a function of holdup time. (auth)

9879 CP-2468
[Chicago. Univ. Metallurgical Lab.]
FISSION PRODUCT POISONING IN A PILE. Katharine Way. Dec. 15, 1944. Decl. Feb. 14, 1956. 23p. Contract W-7401-eng-37. $4.80(ph OTS); $2.70(mf OTS).

The effect of the neutron flux on the relative importance of different fission product poisons is discussed. The general expression for the poisoning of a fission product is given with the various equations for special cases of interest. The formulas are applied to the problem of finding the poisoning due to fission products at the end of one day in a pile operating with a flux of 4×10^{14} neutrons/cm^2/sec. These results are summarized. Appendix I contains a revised list of cross sections × yields for all stable isotopes. Appendix II contains a list of radioactive fission products with half lives greater than one day with data about yields, parents, gaseous ancestors, and numbers of neutrons. (auth)

9880 CP-3061
Chicago. Univ. Metallurgical Lab.
PHYSICAL CONSTANTS OF PROPOSED COOLANTS. Robert Bentley, George Brown, and Richard Schlegel. June 23, 1945. Decl. Dec. 14, 1955. 48p. Contract W-7401-eng-37. $0.35(OTS).

Physical constants, including melting and boiling points, density, heat capacity, thermal and electrical conductivities, viscosity, and vapor pressure are given for a number of proposed liquid and gaseous coolants. Summary tables for quantities which determine heat transfer characteristics are also given. (auth)

9881 CP-3112
Chicago. Univ. Metallurgical Lab.
INTERMITTENT OPERATION OF A PILE. Gilbert N. Plass and Mildred Ginsburg. July 23, 1945. Decl. Feb. 14, 1956. 14p. Contract W-7401-eng-37. $3.30 (ph OTS); $2.40(mf OTS).

It is possible to reduce the loss of neutrons to Xe^{135} by running a pile intermittently, thus allowing the Xe and its parents to decay during the "off" period. Calculations are given showing the average neutron loss for various powers of operation of the pile and various "on–off" times. Curves showing the variation in the number of Xe atoms during such an "on–off" cycle are also presented. (auth)

9882 HW-19901
[Hanford Works, Richland, Wash.]
CALIBRATION OF THE 305 PILE FOR GRAPHITE TESTING. George E. Duvall. Jan. 8, 1951. Decl. Feb. 9, 1956. 8p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The methods of calibrating the 305 pile for impurities and density differences in graphite are reviewed and calibration constants are calculated theoretically. The theoretical impurity calibration agrees with the actual calibrations with 15%. The theoretical density calibration is 30% to 40% smaller than the measured values and it displays a different dependence on graphite cross-section from that which has been reported previously. The discrepancy in this case is great enough to warrant more extensive calibrations. It is shown also that the density calibration obtained by previous methods may differ appreciably from the correction to be applied to normal graphite bars under test because the impurity cross-sections are not properly accounted for. The relation between reactivity differences in the 305 tests and the k of the 105 piles is calculated and found to be Δ ih(105) = 1145 $\Delta \rho$ + 432 (dih) where dih is the 305 value corrected

1954. Decl. Dec. 7, 1955. 12p. Contract [W-7405-eng-26]. $0.15(OTS).

Certain dimensions and geometries have been recommended for the HRT dump tanks. These specifications were based on considerations of criticality, operating time and temperature, and blanket concentration. (C.W.H.)

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9865 CF-54-4-228
Oak Ridge National Lab., Tenn.
MECHANICAL PRESSURIZER AS AN HRT SAFETY DEVICE. Paul R. Kasten. Apr. 22, 1954. Decl. Feb. 9, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The possibility of substituting a mechanical valve for the steam pressurizer arrangement in the HRT was studied from the safety standpoint. Two types of valves were studied, one which starts to open whenever a set core overpressure is exceeded while the other is a spring-loaded solenoid type. For the conditions studied, either type of valve appears to be satisfactory with respect to resulting core overpressures. (B.J.H.)

9866 CF-54-5-164
Oak Ridge National Lab., Tenn.
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Assuming simultaneous failure of the HRT pressure

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A study has been made of the reaction force arising from breaking the inlet fluid flange nozzle of the pressure vessel, the initial pressure and temperature being 2000 psi and 300°C. Based upon reasonable assumptions, the maximum upward distance the pressure vessel could travel would be ~4 feet if no holding force were present. With a 10,000-lb additional weight, the maximum distance would be ~$2\frac{1}{2}$ feet and with a 20,000-lb additional weight the maximum distance would be ~1.6 feet. To ensure zero upward movement a holding force of 50,000 lbs would be required. (auth)

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9879 CP-2468
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FISSION PRODUCT POISONING IN A PILE. Katharine Way. Dec. 15, 1944. Decl. Feb. 14, 1956. 23p. Contract W-7401-eng-37. $4.80(ph OTS); $2.70(mf OTS).

The effect of the neutron flux on the relative importance of different fission product poisons is discussed. The general expression for the poisoning of a fission product is given with the various equations for special cases of interest. The formulas are applied to the problem of finding the poisoning due to fission products at the end of one day in a pile operating with a flux of 4×10^{14} neutrons/cm^2/sec. These results are summarized. Appendix I contains a revised list of cross sections × yields for all stable isotopes. Appendix II contains a list of radioactive fission products with half lives greater than one day with data about yields, parents, gaseous ancestors, and numbers of neutrons. (auth)

9880 CP-3061
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Physical constants, including melting and boiling points, density, heat capacity, thermal and electrical conductivities, viscosity, and vapor pressure are given for a number of proposed liquid and gaseous coolants. Summary tables for quantities which determine heat transfer characteristics are also given. (auth)

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It is possible to reduce the loss of neutrons to Xe^{135} by running a pile intermittently, thus allowing the Xe and its parents to decay during the "off" period. Calculations are given showing the average neutron loss for various powers of operation of the pile and various "on–off" times. Curves showing the variation in the number of Xe atoms during such an "on–off" cycle are also presented. (auth)

9882 HW-19901
[Hanford Works, Richland, Wash.]
CALIBRATION OF THE 305 PILE FOR GRAPHITE TESTING. George E. Duvall. Jan. 8, 1951. Decl. Feb. 9, 1956. 8p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The methods of calibrating the 305 pile for impurities and density differences in graphite are reviewed and calibration constants are calculated theoretically. The theoretical impurity calibration agrees with the actual calibrations with 15%. The theoretical density calibration is 30% to 40% smaller than the measured values and it displays a different dependence on graphite cross-section from that which has been reported previously. The discrepancy in this case is great enough to warrant more extensive calibrations. It is shown also that the density calibration obtained by previous methods may differ appreciably from the correction to be applied to normal graphite bars under test because the impurity cross-sections are not properly accounted for. The relation between reactivity differences in the 305 tests and the k of the 105 piles is calculated and found to be Δ ih(105) = 1145 $\Delta\rho$ + 432 (dih) where dih is the 305 value corrected

for density differences and 432 is an average of the measured calibration constants. This formula is applied to the 105-F and 105-H piles and found to predict a greater reactivity difference between the two piles than was actually observed. (auth)

9883 IDO-16264
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
THE ORGANIC LOOP PROGRAM AT THE MATERIALS TESTING REACTOR. Final Status Report. W. C. Francis. Mar. 3, 1955. Decl. Feb. 7, 1956. 7p. Contract AT(10-1)-205. (PPC-86). $1.80(ph OTS); $1.80(mf OTS).

With the transfer of project responsibility for an in-pile organic loop and the deferment of all other activity on organic loops, the organic loop program at the MTR under the direction of the Phillips Petroleum Company, has been terminated, at least temporarily. The activity of the Phillips program is summarized briefly since its inception in May, 1953, and the status of the program is reviewed. Reference is made, where applicable, to source documents. (auth)

9884 KAPL-M-CME-1
Knolls Atomic Power Lab., Schenectady, N. Y.
HYDROGEN EMBRITTLEMENT OF CARBON STEEL. Carl M. Erb. July 13, 1955. 5p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

An investigation on H embrittlement of carbon steel revealed that a steel containing a minimum alloy addition of 0.5% Mo should not suffer H embrittlement under SAR conditions. H effects due to irradiation in the pressure vessel are not included. (F.S.)

9885 KAPL-M-DPT-2
Knolls Atomic Power Lab., Schenectady, N. Y.
FLOW VELOCITY IN SECONDARY PLENUM OF SANDWICH PLATES. Dominic P. Timo. [1953]. 21p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

The radial Na velocity distribution in the secondary plenum of the sandwich plates at the bottom of the SIR Mark A rotating plug was calculated, and a curve is given showing the variation of radial velocity in the secondary plenum with radius on a radial line normal to the outlet pipes centerline. This velocity is an average of the radial velocity in the secondary plenum. (F.S.)

9886 TID-10102
Oak Ridge National Lab., Tenn.
A HAZARDS SUMMARY FOR ROUTINE OPERATION OF THE BULK SHIELDING REACTOR AT ONE MEGAWATT. F. C. Maienschein. Dec. 20, 1954. Decl. Jan. 13, 1956. 62p. Contract W-7405-eng-26. $0.40(OTS).

The Bulk Shielding Reactor (BSR) consists of an assembly of modified MTR-type fuel elements suspended in a "swimming pool" filled with demineralized water. It has operated since 1951 at power levels up to 100 kw. This report, after describing the existing facility, suggests modifications which would permit part-time routine operation at 1 megawatt. Finally, the hazards associated with higher power operation have been considered. (auth)

9887 WAPD-TH-162
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
INVESTIGATION OF THE EFFECT OF A PARALLEL CHANNEL ON FLOW AND BURNOUT FLUX. H. S. Jacket, J. D. Roarty, and G. Sonnemann. Dec. 6, 1955. 11p. $3.30(ph OTS); $2.40(mf OTS).

Preliminary parallel channel tests at 2000 psia were run with a vertically mounted heated test section and an unheated by-pass line that had a flow area 30.5 times that of the hot channel. The flow channel dimensions of the machined and corrosion tested Zircaloy-2 test specimen were 0.097 in. × 1 in. × 27 in. long. Tests were run with inlet temperatures of 400,575 and 625°F and initial isothermal hot channel velocities of 6, 8, and 10 ft/sec. (auth)

NUCLEAR TRANSFORMATION

9888 MonC-169
[Clinton Labs., Oak Ridge, Tenn.]
STUDIES ON THE PREPARATION AND PROPERTIES OF A LONG-LIVED ISOTOPE OF ELEMENT 43 PRODUCED BY THE NEUTRON IRRADIATION OF MOLYBDENUM METAL. Progress Report [for] February 15 to September 15, 1946. Problem Assignment No. CX6-7. G. E. Boyd. Sept. 15, 1946. Decl. Feb. 15, 1956. 17p. Contract W-35-058-eng-71. $3.30(ph OTS); $2.40(mf OTS).

An isotope of element 43 of 1.2×10^6 y half-life has been isolated from Mo metal irradiated for several months in the Clinton chain reacting pile. The activity appears to decay by the emission of a β-particle of 85 mg/cm^2 range in Al, or with 320 KeV energy. Although the presence of nuclear gamma radiation cannot be excluded, a β:γ counting ratio of greater than 800 suggests its absence. This "43" activity has been tentatively assigned to the ground state of the isomeric 43^{99} nucleus. The isolation of 0.35 mg of this isotope has been achieved. (auth)

9889 MonP-172
Clinton Labs., Oak Ridge, Tenn.
YIELD OF PHOTONEUTRONS FROM U^{235} FISSION PRODUCTS IN HEAVY WATER. S. Bernstein, W. M. Preston, G. Wolfe, and R. E. Slattery. Appendix: NEUTRON YIELD FROM MULTIPLY SCATTERED COMPTON PHOTONS. E. Greuling. Final Report—Problem Assignment PX10-15. Sept. 24, 1946. Decl. Jan. 12, 1956. 38p. Contract W-7405-eng-39. $0.30(OTS).

The half lives and yields of the photoneutrons created in heavy water by U^{235} fission product gamma rays have been measured. Seven half-lives have been found: 2.5 sec., 41.2 sec., 2.38 min., 7.7 min., 27.3 min., 1.65 hr., 4.37 hr., had 53 hr. The shortest one and longest one of these are least reliable. Eighty-five percent of the photoneutrons appear in the two shortest half lives, the 2.5 sec. component being three times as intense as the 41 sec. component. The total saturated activity of the photoneutrons for an infinite amount of heavy water was calculated from measurements with a 10-in. radius sphere to be about 16.5% of the saturated delayed neutron activity. The data indicate that there must be of the order of two gamma rays, of energy above 2.17 Mev, emitted per fission by fission products with half lives longer than one sec. (auth)

RADIATION ABSORPTION AND SCATTERING

9890 CF-54-8-96
Oak Ridge National Lab., Tenn.
SINGLE ISOTROPIC AIR SCATTERING OF NEUTRONS IN THE PRESENCE OF THE GROUND (UNSHIELDED DETECTOR). J. E. Faulkner. Aug. 31, 1954. 9p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Calculations are made of the fraction of air scattering occluded by the presence of the ground as a function of altitude for the case in which the source and detector are at equal heights above the ground. (B.J.H.)

9891 MonP-283
[Clinton Labs., Oak Ridge, Tenn.]
PENETRATION OF FISSION NEUTRONS THROUGH WATER. E. P. Wigner and G. Young. Apr. 9, 1947. Decl. Jan. 10, 1956. 7p. Contract W-35-058-eng-71. $1.80(ph OTS); $1.80(mf OTS).

In order to determine the effectiveness of H_2O as a reactor neutron shield, calculations were made of penetration of fission neutrons through water. (B.J.H.)

RADIATION EFFECTS

9892 HW-35284
Hanford Atomic Products Operation, Richland, Wash.
FLEXURE TESTS ON IRRADIATED TEFLON BELLOWS. P. B. McCarthy. Feb. 1, 1955. Changed from OFFICIAL USE ONLY Feb. 2, 1956. 4p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Although the published literature states that teflon is not damaged by radiation exposures below 10^6r, the results of flexure tests indicate that the radiation exposure limit for teflon bellows which are to be subjected to continuous flexing conditions is approximately 10^5r. Below this radiation exposure, other effects such as machining tolerance, teflon purity, and stress assume more importance to the life expectancy of the bellows than the effects of radiation. (auth)

RADIOACTIVITY

9893 UCRL-2184
California. Univ., Berkeley. Radiation Lab.
NUCLEAR EVAPORATION FROM URANIUM. Warren Heckrotte. Apr. 7, 1953. Decl. Mar. 23, 1956. 21p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

Investigation was made of nuclear evaporation from U by means of the existing theories on the emission or evaporation of nucleons from an excited nucleus. For a given excitation energy, the number and kind of nucleons emitted and their energy distribution are calculated. (W.L.H.)

SHIELDING

9894 AECD-3978
Oak Ridge National Lab., Tenn.
EFFECTIVE NEUTRON REMOVAL CROSS SECTIONS FOR SHIELDING. G. T. Chapman and C. L. Storrs. Sept. 19, 1955. Decl. with deletions Dec. 2, 1955. 152p. Contract W-7405-eng-26. $0.75(OTS).

The effective removal cross section concept as applied in shield calculations is discussed and a method of determining the numerical value of this cross section from LTSF experimental data is presented. Radiation intensity measurements in water and the corresponding removal cross section values are reported. These values are useful in determining the relative shielding effectiveness of the various materials, but can be used with complete assurance for shielding calculations only when the geometry under consideration closely resembles that employed at the LTSF. A graphical comparison of the effective removal cross sections and the total cross sections at a high neutron energy (8 Mev) is also made and should be applicable to shield calculations. In addition, calculations are presented of correction factors for various values of the water thickness, sample thickness, and attenuation lengths in order to facilitate the calculation of the removal cross section from future measurements. (auth)

9895 AECD-4222
[Knolls Atomic Power Lab., Schenectady, N. Y.]
OBLIQUITY FACTORS FOR SHIELDS. Harvey Brooks. Aug. 15, 1947. Decl. Mar. 26, 1956. 5p. Contract W-31-109-Eng-52. (MEMO-HB-8). $1.80(ph OTS); $1.80(mf OTS).

Obliquity factors for spherical and cylindrical neutron shields are briefly discussed. (B.J.H.)

9896 CF-50-8-65
Oak Ridge National Lab., Tenn.
ANTIMONIAL LEAD AS A POSSIBLE GAMMA SHIELD. H. G. Duggan. Aug. 1, 1950. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS), $1.80(mf OTS).

A study was made of the possible usefulness of antimonial lead as a γ shield. Advantages of antimonial lead over chemical lead include its wider temperature range for casting, hardness, and tensile strength. Its disadvantages include its density, higher cost, and the fact that Sb becomes radioactive when exposed to neutron radiation. It is concluded that there are some special applications where antimonial lead would be more suitable. (B.J.H.)

URANIUM AND URANIUM COMPOUNDS

9897 AECD-4190
Tennessee Eastman Corp., Oak Ridge, Tenn.
CRITICALITY IN UNTAMPED URANIUM SOLUTIONS. Raymond Murray and George W. Schmidt. Feb. 4, 1947. Decl. Feb. 15, 1956. (A-7.390.24). $3.30(ph OTS); $2.40(mf OTS).

A new conservative method of determining critical concentrations and masses of pure U^{235} in water solutions is described. An experimentally determined source function involving diffusion length characteristic to several neutron energies is used instead of the simpler Fermi age theory source. (F.S.)

9898 AECD-4191
Tennessee Eastman Corp., Oak Ridge, Tenn.
CRITICAL CONDITIONS IN CYLINDRICAL VESSELS. John W. Morfitt, Raymond Murray, and George W. Schmidt. Jan. 22, 1947. Decl. Feb. 15, 1956. 16p. (A-7.390.22). $4.80(ph OTS); $2.70(mf OTS).

A rapid method of calculating the critical masses of aqueous solutions of enriched U compounds in cylindrical containers is developed. Results involve an inherent safety factor and as such are conservative. (F.S.)

9899 AECD-4208
Argonne National Lab., Lemont, Ill.
EFFECT OF VARYING REDUCTION ON THE PREFERRED ORIENTATION IN ROLLED URANIUM RODS. Final Report. M. H. Mueller, H. W. Knott, and P. A. Beck. May 3, 1954. Decl. with deletions Apr. 25, 1955. 33p. Contract W-31-109-eng-38. $0.25(OTS).

The preferred orientation in U rods rolled to various reductions at 300 and 600°C was studied. The rods used for the 300°C final rolling were obtained from 3 groups which had been previously either rolled at 600°C, or rolled at 300°C and annealed at 550°C, or beta treated. The rods used for the 600°C final rolling were obtained from material previously beta treated. It was found that, regardless of the starting material, the orientation obtained was the same if the reduction at 300°C was approximately 70% or greater. A considerable variation in orientation was observed in rods with lower reduction. The type of orientation developed by 600°C rolling is somewhat different from that obtained by 300°C rolling. Thermal cycling and thermal expansion data are also given for these rods. (auth)

9900 AECD-4225
Tennessee Eastman Corp., Oak Ridge, Tenn.
OBSERVED DIFFERENCES IN THE ARC SPECTRA OF U^{235} AND U^{238}. D. R. Long and D. D. Smith. Jan. 15, 1947. Decl. Feb. 21, 1956. 10p. Contract W-7401-eng-23. (B-4.380.121). $1.80(ph OTS); $1.80(mf OTS).

It has been found that the two principal U isotopes exhibit slightly different arc spectra. Certain U^{235} lines

have been found to be displaced from corresponding U^{238} lines by about one reciprocal centimeter. The intensity ratio, I_U235/I_U238, has been shown to be a steadily increasing function of the U^{235} concentration. These data indicate the possibility of developing a method for the determination of isotopic concentration by means of emission spectra. (auth)

9901 CT-2635
Chicago. Univ. Metallurgical Lab.
MICROSTRUCTURE OF TUBALLOY [URANIUM]. Final Report on a part of Problem Assignment No. 390-ML-54-S, F.S. 17. F. Foote, J. R. Clark, R. W. Yancey, and J. R. Lane. Feb. 13, 1945. Decl. Feb. 14, 1956. 21p. Contract W-7401-eng-37. $4.80 (ph OTS); $2.70 (mf OTS).

9902 LA-1571
Los Alamos Scientific Lab., N. Mex.
FISSION COMPARISON OF U^{238} AND U^{235} FOR 2.5 Mev NEUTRONS. G. A. Jarvis. July 1953. Decl. Feb. 29, 1956. 10p. Contract W-7405-eng-36. $1.80(ph OTS); $1.80(mf OTS).

A fission comparison of U^{238} to U^{235} was made, which was used as a basis for the normalization of the U^{238} fission excitation curve. The ratio of the fission cross section was found to be 0.425 ± 1.5% for 2.5-Mev neutrons. (W.L.H.)

Refer also to abstract 9893.